FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

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INDEX AND TITLE PAGE FOR VOL. XII.

The 8-page Index for Vol. XII of "FLIGHT" (January to December, 1920) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 1/- per copy, post free.

DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

May ...	Seaplane Contests on Lake Garde, Italy
May 15 ...	Entries Close for Schneider Cup
May 21 ...	U.S.A. National Balloon Race, Alabama
June 10 ...	Race, Lugo–Trieste–Triente–Lugo
July 6 ...	Entries close for Aerial Derby
July 16 ...	Aerial Derby
July 29–31	Jacques Schneider Cup, Venice
Sept. 4–11	Brescia Races
Sept. 5 ...	Pulitzer Trophy, Detroit, U.S.A.
Sept. 18 ...	Gordon Bennett Balloon Race
Sept. 25–Oct. 2	Aero Exhibition, Prague
Nov. ...	Paris Aero Salon

EDITORIAL COMMENT

The Air Estimates

THE new Secretary of State for Air, Captain Guest, can hardly be said, when introducing the Air Ministry Estimates last week, to have exhibited any super brilliancy, either in oratory or manipulation. But he showed himself thoroughly conversant with the various problems that the air presents for solution, although some of the leanings which he apparently has hardly commend themselves altogether to our liking. There is little harm in diversity of opinion, as at least this tends to strengthen the ultimate issue by calling into being Constructive criticism which, if based upon sound lines, must in the end enforce recognition, and be to the benefit of the harnessing of the realm of the air. On the whole, the Air Minister gave a clear exposition of the present position and of what has led up to the various developments for which the present vote is required. He is, we think, too inclined to give the benefit of the doubt to undue immediate expansion on the military side, although we fully appreciate that within the next decade this aspect of aviation may well prove the life-line of the Empire. On the other hand, commercial aviation is and has been greatly handicapped in its progress, both with the authorities and the general public, by the persistence with which it has been viewed almost entirely from the war-machine angle.

On the subject of research, we are glad to see the new Air Minister appears fully alive to the importance—the vital importance—of not handicapping the scientific aspect, and we can thoroughly endorse his view that "Research includes such an infinite variety of scientific problems that it is too dangerous to run any risk of getting behind other nations. The progress of science is an incalculable factor, and in this particular service science is our closest friend."

When it comes to the "economy" effected last year of £400,000 on the Vote for Civil Aviation, and with which the Air Minister appears very pleased because it can now be expended this year, we cannot quite agree with him. The reasons given by him for this economy were that there was a want of general public interest in civil aviation. We would point

out that any such lack on the part of the public can be to a great extent ascribed to the way in which the whole business was handled. In the case of a new mode of transport like that of flying it is no earthly use sitting down waiting for the public to clamour for air services. Run the services and prove to the business man that such services are to his advantage, and he will very quickly avail himself of them. If the £400,000 had been spent last year, civil aviation would have been in a very different position now.

Turning to the temporary arrangement for subsidising the London-Paris air services, Capt. Guest stated that at present there are two firms running this service and that the present temporary arrangement is that the Air Council guarantee a clear profit of 10 per cent. to each firm on gross receipts. The subsidy is to be £75 for each single flight, with a maximum limit of £25,000 to each firm during the period of seven months. As a temporary measure there does not appear to be much to find fault with in these figures. The sum of £75 per flight would appear to be somewhat unfair, as it does not differentiate between a flight made by a small three-seater and one of a large twin-engined machine carrying 10 or 12 passengers. However, the profit made by the smaller machine will naturally be less, assuming both to be carrying full load, and so matters may tend to level themselves. In connection with the London-Paris services we should like to point out a small error into which Capt. Guest fell. On the question of the fares charged by the French and British companies, he stated that the French fare was £5 while the British services charge six guineas. This might convey the general impression that our own services are dearer than the French. As a matter of fact this is not so. The French figure of £5 is for the air trip only, while the British figure includes conveyance to and from the terminal aerodrome. Thus by the time air passengers have paid for conveyance between London and Croydon and between le Bourget and Paris they will have paid at least as much as the fare charged by the British services.

On the vexed question of the future of our airships Capt. Guest said very little, and this called forth some remarks by Sir William Joynson-Hicks, who said that he could not believe that out of an estimate of £8,000,000 economies to the tune of £250,000 could not be effected so as to save money for the airships on which so much has been spent.

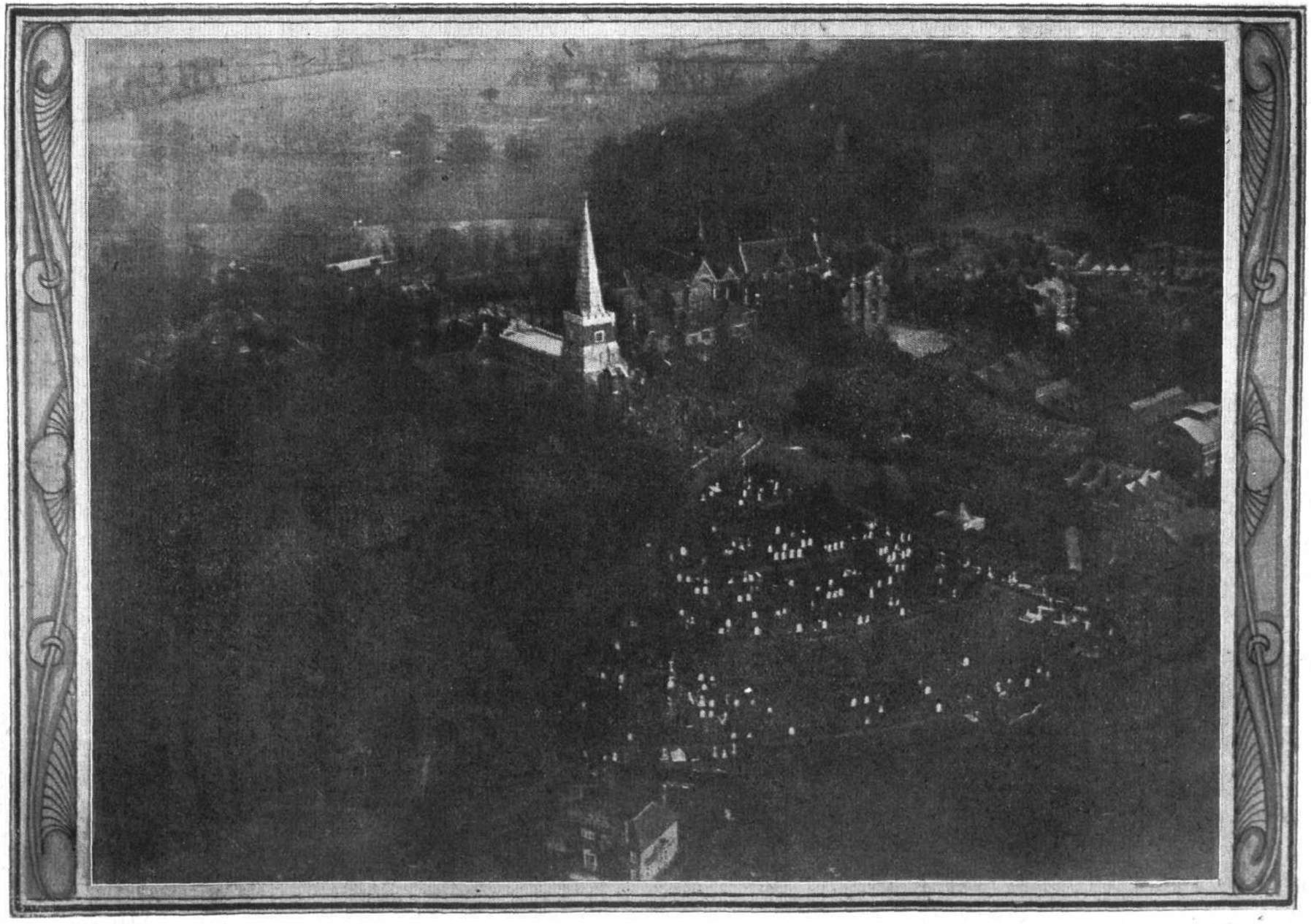
Our own opinion of the airship question has been expressed so often in these columns that there is no need to repeat it. The decision to delete airships from our service programme was mainly caused by considerations of economy, but there are numerous people, people who should be in a position to judge, who have the greatest belief in airships for commercial work, and we cannot agree that anything resembling proof to the contrary has been advanced by the opponents of airships. In his reply Capt. Guest stated that although the decision to abandon airships was taken some weeks ago there are some suggestions put forward which may lead the Air Ministry to temporise a short time longer. He asked for patience for a few weeks more, when he hoped to make a more definite statement. Really these pious hopes do not get us any farther, and it is highest time that something tangible were done. Secrecy has surrounded the negotiations which are said to have taken place between the Air Ministry and financial groups regarding the taking over of all our rigids. Surely it is time that something was done, or else a plain statement should be made as to why nothing has come of these negotiations. So far as our information goes, the offers made to the Air Ministry were of a reasonable nature, and we think a full and clear explanation of the apparent failure to come to an agreement is long overdue.

* * *

The Return of the Monoplane

If one were asked to define briefly the trend in modern aeroplane design, the answer might very well take the form "the return of the monoplane." Curiously enough, the present revival of the monoplane type of machine—and that there is evidence of a revival is undoubted—does not appear to be a result of aims at greater speeds than those attained by the biplanes that have for many years superseded the monoplane. On the contrary, the modern monoplane owes its existence to quite different reasons. In the early days of flying, the monoplane was almost universally held to be capable of far greater speeds than was the biplane. The monoplane was gaining a very strong footing in those days as being pretty, handy, and fast. Then came a period of accidents to monoplanes of various types and makes, and the result was that, with the imperfect knowledge of aeroplane stresses which we then had, the monoplane was banned for a period, until it could be ascertained whether or not the weakness was due to the monoplane type or to minor constructional details. For a long period the ban on monoplanes kept these machines out of the air, and about the same time a British firm, Sopwiths to be more explicit, showed to a somewhat startled aeronautical world that the biplane, power for power, could be made at least as fast as the monoplane. This fact, in conjunction with the—probably quite undeserved—bad *renommée* which the monoplane had acquired led to the type being practically dropped in favour of the biplane. So much has this been the case that, in this country at any rate, the monoplane was, for years, practically never seen. The biplane could do all that the monoplane could do, and appeared to be safer. Consequently everybody turned their attention to biplanes and the monoplane was forgotten.

In view of the present revival of the monoplane it may naturally be asked what are the reasons that have led to its reappearance? In the first place there is little doubt that, had it not been for the introduction of the internally braced, thick-section high-lift cantilever wing, the monoplane would not have been revived. For the cantilever type of wing, however, the monoplane formation is eminently suitable, giving a very clean and unencumbered outline with a minimum of "parasite" resistance. If the cantilever wing is used as a biplane some of this advantage is lost. Again the monoplane surface has always been more efficient than the biplane combination, and for that reason, when there are other inducements, its adoption has much to recommend it. For commercial work the simplicity of the cantilever wing is a considerable asset. Thus to take the case of the Fokker monoplanes in service on the London–Amsterdam air line: the wing is held to the *fusclage* by four bolts only. If, therefore, the internal construction is such as to prevent warping



HARROW-ON-THE-HILL IN A HAZE: A SNAP FROM A CENTRAL AIRCRAFT 'PLANE

of the wing, there are practically no adjustments required for very long periods. In the case of biplanes with external bracing there are numerous alignments that have to be maintained if the machine is to retain its flying qualities. Bracing wires and their attachments stretch and the structure warps. It may not be enough to require any great adjustment for considerable periods, but the very knowledge that trueing up may be required necessitates a constant watch being kept on the rigging of a machine.

In conjunction with the cantilever wing, a feature which has also helped to re-introduce the monoplane form is that such a wing is necessarily of deep section, and therefore, if it is well designed, gives a high lift. This means smaller wings for a given load, so that for medium sized machines one wing can carry the load without reaching unduly great dimensions.

Whether the monoplane has come to stay or not is impossible to forecast at the moment, but undoubtedly the type is occupying the minds of designers to a greater and greater extent. In this country several designers have completed their drawings, and have in several instances commenced manufacture, of cantilever monoplanes. Capt. de Havilland has under way a couple of machines of this type which promise very well indeed. The Bristol company also are experimenting along these lines, Capt. Barnwell having obtained some rather promising results with wings of a type somewhat different from that of the de Havilland machines. Blackburns are continuing their research and experiments with the "Alula" wing, which differs again from both the de Havilland and the Barnwell designs. Then there is the extraordinary Voyewodsky design, in which the *fuselage*, tail and all exposed components are designed as lifting surfaces.

The New H.P. Monoplane

There are thus not lacking indications, in this country alone, that we are at present at the beginning of a monoplane era. Future alone can show whether or not this is the wisest direction for development. The general concensus of opinion appears to be that the monoplane—in its modernised version—is well worth going on with. The latest British convert to the monoplane type is Mr. Handley Page, whose new monoplane is referred to elsewhere in this issue. Apart from the fact that it is a monoplane with thick, high-lift wings, the new H.P. machine is of more than ordinary interest on account of the fact that it is to be fitted with the H.P. "slot." This will be the first time the slotted wing is tested on a machine specially designed for it, and it is, perhaps, not too much to say that its trial flights will be looked forward to with greater interest than those of almost any other machine at present building. For the first time for years a radical departure from standard wing sections is to be tried out thoroughly. That the designers expect the new machine to be a great improvement on present ones is evidenced by the fact that it is expected that by using it the fares on the London-Paris service may possibly be reduced to a matter of £5 or so. When it is remembered that the new machine is intended to carry 12 passengers for a horse-power of 350, or about 30 h.p. per passenger, this expectation seems not at all unreasonable, and if it is fulfilled a tremendously great step will have been made towards true commercial aviation. While we have to expend anywhere between 50 and 60 h.p. for each passenger carried, flying must necessarily be fairly expensive, especially as the fuel costs of an air service are probably somewhere about 30 per cent. of the total running costs.

ROYAL AIR FORCE CADETSHIPS

Forthcoming Entrance Examination

THE Air Ministry announces that an examination for entrance into the Royal Air Force Cadet College will be held on June 28, 1921, and following days.

The number of cadetships open to competition at this examination will not be less than 25, inclusive of King's Cadets or Honorary King's Cadets, and will include the award of not less than one prize cadetship.

Candidates must have attained the age of 17½ and not have attained the age of 19 on July 1, 1921, the only exception being in the case of a candidate who—

(*a*) Was serving on January 1, 1920 (or who had served prior to that date), in the Royal Navy, Royal Marines, Regular Army, Royal Air Force, Special Reserve, Indian Army Reserve of Officers, Militia, Territorial Force, or in the Forces of the Overseas Dominions; or

(*b*) Was serving on March 1, 1919 (or who had served prior to that date), in the Senior Division of the Officers' Training Corps;

and who, in addition to fulfilling the above conditions, is recommended by his commanding officer as suitable in all respects for appointment to a permanent commission in the Royal Air Force, in which case the upper limit of age will be 21.

Candidates must apply in writing to the Secretary, Civil Service Commissioners, Burlington Gardens, London, W. 1, for forms of application, and the forms should be completed and returned not later than May 12, next. No application received later than May 26 will be accepted under any circumstances.

The competition will be conducted in accordance with the Provisional Regulations for the Royal Air Force (Cadet) College; (Air Publication, 121), which may be obtained from His Majesty's Stationery Office, Imperial House, Kingsway, W.C. 2. (Price 6*d*.)

The "Wakefield" Scholarships

To assist in defraying the expenses of residence at the Royal Air Force (Cadet) College, in the case of cadets whose parents or guardians are in reduced circumstances, Sir Charles Wakefield has generously undertaken to provide funds for a period of three years for the annual award of two scholarships, each of the value of £75 per annum.

Preference will be given where reduced circumstances are due to the late War.

One scholarship will be offered for competition at the examination held in June, and one at that held in November. Scholarships will be tenable for two years.

On each occasion the scholarship will be awarded to the candidate, accepted as eligible by the Air Council, who passes highest into the College.

The names of intending candidates should be forwarded to the Secretary (S. 7), Air Ministry, Kingsway, London, W.C. 2.

Applications should normally reach the Air Ministry not later than January 15 and May 15, in the case of the June and November examinations respectively. They will, however, be accepted provided they are received not later than May 1 and October 1, respectively.

Each application should be accompanied by a full statement (which will be treated as strictly confidential) of the circumstances of the candidate's case. The Air Council will decide upon the eligibility or otherwise of the candidate.

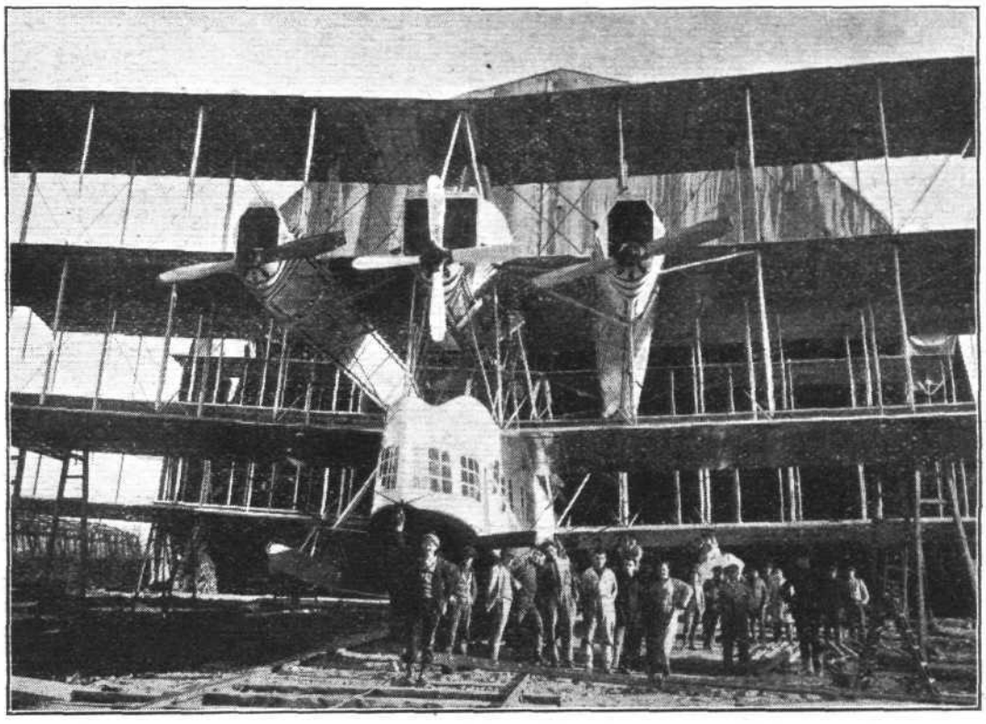
A King's Cadet, Prize Cadet, or a Candidate nominated under Section VIII of the Provisional Regulations for the Royal Air Force (Cadet) College (Air Publication, 121), will not be eligible to hold a Wakefield Scholarship.

FLIGHT

THE CAPRONI "NINEPLANDEM" FLYING BOAT:

Eight 400 H.P. Liberty Engines

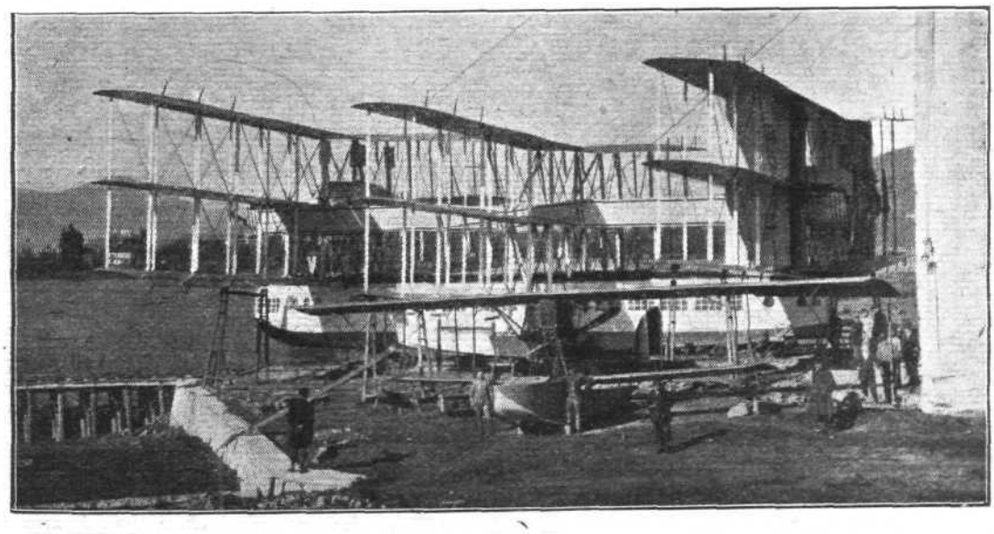
IN spite of its sudden demise during one of its first test flights, it appears worth while to place on record a few particulars of the large Caproni triple triplane, variously called the "Capronissimo," from the fact that Signor Caproni is said to contemplate much larger machines on similar lines, and the "Nineplandem," from the arrangement of its carrying surfaces. The machine was of such an extraordinary design that one felt doubtful as to it being controllable, when and if it once got into the air. We have no information as to the exact cause of the accident, but from what can be gathered it appears that lack of control may have been responsible for the dive into the sea.—ED.



The Eight-engined Caproni: Front view of central portion, showing nose of cabin and the housing of the four front engines. The rear engine set is similarly arranged, except that the three engines drive pusher screws.

The reasons which led Signor Caproni to choose this unusual arrangement are various. In the first place, he is a great believer in multiple engiues, and this arrangement has afforded him an opportunity of working in no less than eight, four at each end. The arrangement of these engines should be understood from one of the accompanying photographs, which shows the centre portion of the front triplane surface, and the nose of the main hull, as well as of the two auxiliary *fuselages*. Each of the latter carries in its nose an engine with nose radiator. Between the two *fuselages* is mounted a shorter engine *nacelle*, which carries two engines, one driving a tractor and one a pusher. The arrangement of the rear set of engines is similar, except that the three screws are pushers and one (the central one in the nose of the rear central *nacelle*) a tractor.

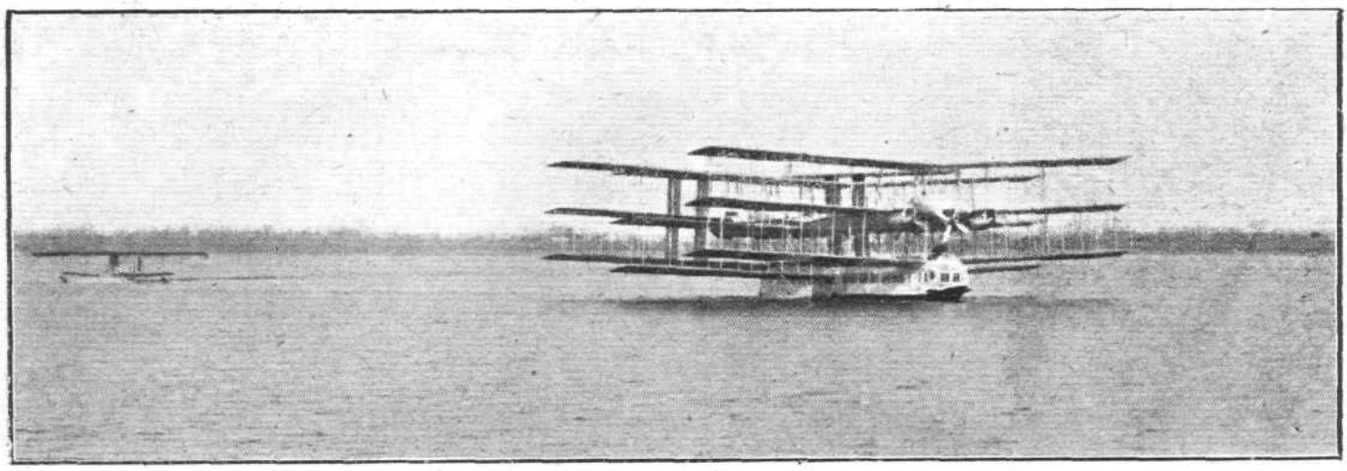
In addition to the two sets of triplanes at the ends of the machine, there is a third set midway between them. This set is so placed as to be on a slightly lower level than the other two. Whether this is done to get a certain amount of "stagger effect" is not known, but this seems probable. Lateral stability on the water is obtained by small auxiliary floats placed underneath the lower plane of this central triplane set. The main float hull is placed underneath the triplane surfaces, the lower planes of which rest on its roof,



The Caproni "Nineplandem": Three-quarter rear view. A good idea of the size of the machine may be formed by comparison with the men, and with the single-engined flying boat standing in front of the large machine. Note the biplane rudders between the rear planes.

as regards the front and rear sets, while the middle triplane has its lower wing roots attached to the sides of the cabin.

The latter is a huge boat with flat sides and Vee bottom with two steps, the front one of which occurs below the middle triplane, approximately under the centre of gravity, while the second and smaller step is under the leading edge of the rear

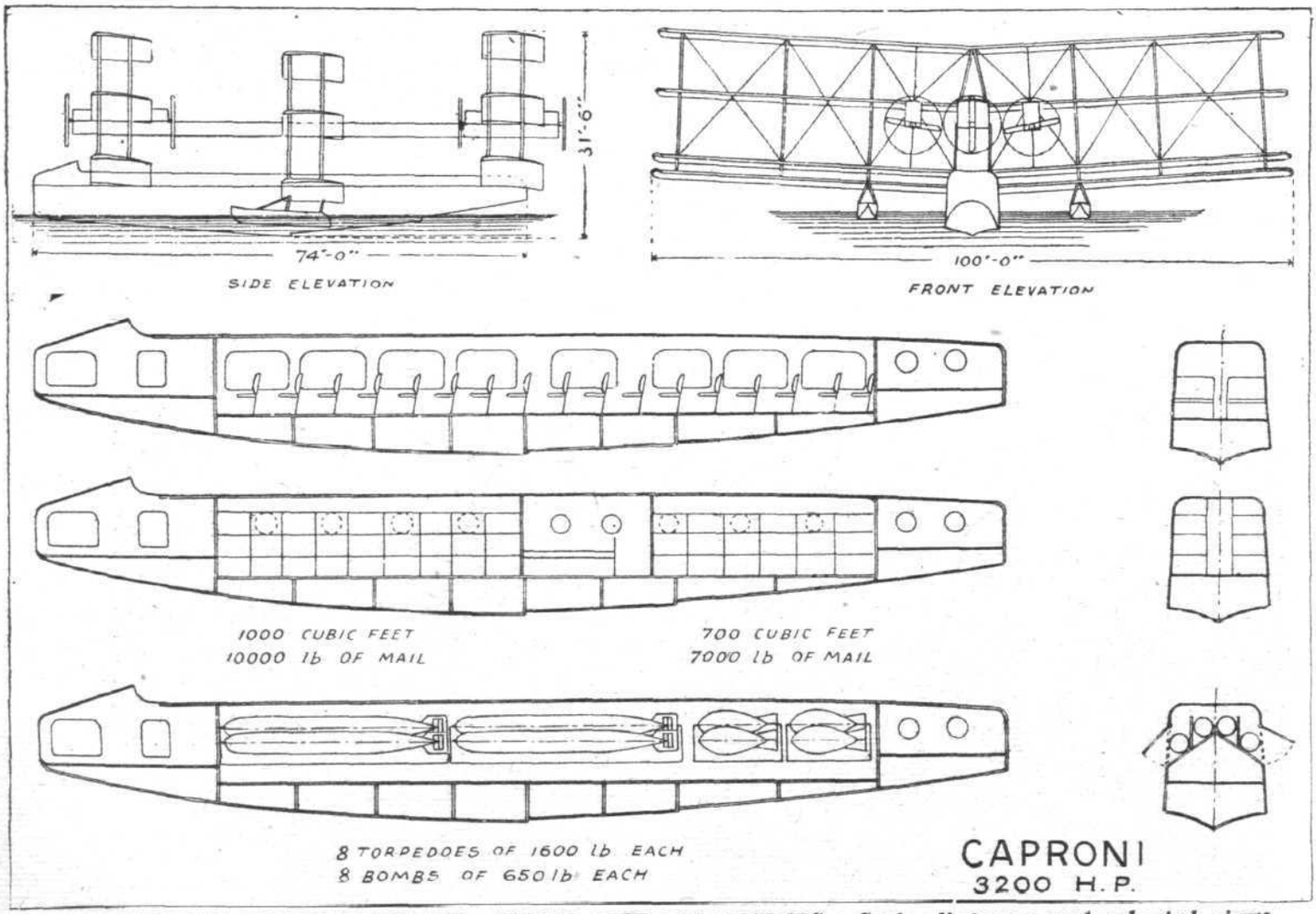


THE EIGHT-ENGINED CAPRONI TAXYING : Note the small flying boat on the left.

set of triplanes. The passengers are seated along the sides of this enormous hull, and windows are provided along the entire length so as to give all the passengers a good view.

The engineers can crawl along the twin *fuselage* from stern to stern in order to get to the engines and effect minor repairs. In proportion to the span of the machine, the distance between the centre line and the outer engines is very small, and consequently it is hoped that the yawing couple in case of one of the side engines cutting out will be so small as to come easily within the scope of the rudders. These, by the way, are large biplane surfaces placed in the *cellule* of the rear triplane, and probably it is expected that they will make up in area for their absence of "leverage," placed as they are practically at the stern of the machine, certainly not behind it.

As regards lateral control, there does not appear to be any reason why this should be greatly different from that of the ordinary type of machine. *Ailerons* are fitted to all three sets of planes, and are so arranged that they act also as elevators. Exactly how this is accomplished we do not know, but probably the *ailerons* on the front set of triplanes move down when those of the rear set move up, while the centre set of *ailerons* retain their differential action as *ailerons* pure and simple. Whether this system proved effective enough is difficult to say. The trim of the machine, with the weight spread out longitudinally as it is, must be supposed to involve considerable forces, and whether the extra lift on one set, coupled with decreased lift on the set at the other end of the machine is sufficient seems somewhat doubtful. Much of the weight (that of four engines at each end), for instance, is concentrated at the ends, so that the longitudinal moment of inertia must be enormous. With regard to interference between the planes, we are informed that this



THE CAPRONI TRIPLE-TRIPLANE, EIGHT LIBERTY ENGINES : Scale diagrams and enlarged views of boat for various purposes. In the front elevation the lower plane only of the middle triplane is shown, in order to avoid confusion. The middle triplane, it will be seen, is on a slightly lower level than the other two.

has proved to be much smaller than one would expect from model tests. In other words, the efficiency of the planes is better than the arrangement would lead one to think. Be that as it may, it is probably longitudinal and directional control that will prove to be the bugbear of the tandem triplane arrangement.

Closely connected with this question of longitudinal control is the problem of taking off. Before this can be done, unless the machine is simply pulled along the water until there is enough force on the wings to lift it, without altering its attitude, the nose will have to be brought out clear of the water, while the rear of the hull is depressed, and one cannot help wondering whether this is a practical proposition. It is true that the machine did actually get off, but then she carried, in addition to pilot and mechanics, 1½ tons of ballast only, which is a relatively small proportion of the weight of the 100 passengers. With full load the matter might be considerably more difficult.

Signor Caproni certainly deserves praise for his bold departure on such a large scale, and it is to be regretted that the accident has effectively stopped further experiments, but one hopes that some useful data may have been collected, which will show definitely whether or not the design is worth repeating. Following are the main data relating to the machine :

Span, 98 ft. 6 ins.; length o.a., 79 ft.; chord, 9 ft. 4 ins.; total wing area, 7,680 sq. ft.; weight of wings, 12,300 lbs.; weight of boat, 6,400 lbs.; weight of *fuselages* and *nacelles*, 3,520 lbs.; weight of engines, 10,600 lbs.; total weight empty, 32,800 lbs.; weight all on, 55,000 lbs.; cruising speed, 87 m.p.h.; fuel consumption, 1,100 lbs./h.; duration, 5 to 6 hours.

THE MONACO SEAPLANE MEETING

A "Fly-Over" for Caudrons

IT cannot truthfully be said that the seaplane meeting at Monaco was a greater success this year than it has been in the days gone by. As a matter of cold fact, the word fiasco comes very near to describing the period between April 13 and 20. To begin with, the meeting was robbed of a great deal of interest, as far as we are concerned, by the absence of any British machines in the entries list. The Italian representatives arrived late, and when they did turn up they were, for various reasons, prevented from taking part in the competitions. Of the French machines entered, the one which most nearly approached modern ideas was wrecked during one of its preliminary test flights, and there was then left only the Caudrons and a Spad. The latter came to grief in going out of the harbour, "and then there were two." Maicon's three-engined Caudron came down and damaged its floats at Antibes, "and then there was one"—Poirée's single-engined Caudron. Truly not a very brave show. The sum total of the whole affair is that Maicon pockets 52,000 francs, and his fellow-pilot Poirée 24,000 francs. Both have earned their money easily, and from a sporting point of view the whole thing has been devoid of interest. It would probably be possible to unearth in various odd corners of the Kingdom a half-dozen pre-War machines and to put up with them a far more sporting event than the Thirteenth Monaco Meeting. Perhaps the number had something to do with the failure. It is to be hoped that the Schneider race at Venice, which is *the* classic seaplane race of the year, will be a more interesting event.

On April 19 the "*Petite Croisière*," Monaco-Cannes-San Remo-Monaco was flown, the course having to be covered twice. In this event the competitors were to be divided into two classes : the weight-carrying machines which carried all the instruments, ballast, etc., required for the Monaco-Ajaccio-Monaco flight, and the smaller machines which were not required to carry any load. Four machines had qualified for the event—Maicon's three-engined Caudron "C.39," Poirée's single-engined Caudron "C.51," Lalouette's Spad, and Maddalena's Savoia, which was to be piloted by Bologna. The Caudron "C.39" was the only entrant in the large class, the other three machines being in the second set.

Maicon started off at 1.30 p.m. in the direction of Cannes, and shortly afterwards was seen a couple of miles off Monaco, making for San Remo at a very low altitude. His first lap of the course was covered in 1 h. 13 mins. 12⅘ secs., his second lap taking 1 h. 12 mins. 28⅗ secs., giving a total time of 2 hrs. 25 mins. 41⅘ secs. As the two laps of the course amount to approximately 176 miles, Maicon's speed works out at about 73 m.p.h. In the small machine class, Poirée started off at 4.30 p.m., and completed the two laps of the course in 2 hrs. 5 mins. 7 secs., or at an average speed of 84·5 m.p.h.

The Savoia" Mishaps

In the meantime, Bologna, who was flying Maddalena's Savoia, Maddalena having gone back to Sesto Calende, brought out his machine and commenced taxying out of the harbour. He quickly got up speed, and, when just between the two lighthouses, got "unstuck," but apparently too soon, as the machine dropped into the sea again with considerable force, the boat springing a leak and the machine only being salved with great difficulty and hoisted on to the north quay by the faithful old *Polyphème*.

About five o'clock a dark speck appeared in the direction of Mentone. This turned out to be the Savoia racer, which Maddalena had brought across from Sesto Calende in order to fly in the speed competition on April 20. The machine came along at a good pace, and at first it was thought that it would alight, as did Janello last year, just at the entrance to the harbour. However, whether Maddalena misjudged his distance, or whether he thought it unsafe to alight in the little harbour with such a fast machine, he actually alighted outside the *Tir aux Pigeons*, where there was a considerable swell, and in so doing punctured his boat, which commenced to sink. Boats quickly came to his rescue, and the machine was towed into port in a badly bent condition. Here occurred an amusing incident. As the somewhat bedraggled Maddalena stepped ashore from his submerged flying boat a customs officer approached and asked him if he had "anything to declare." The good official appeared quite unconscious of the humorous side of the situation, and it will be understood that the moment was not opportunely chosen. Needless to say, Maddalena was not in the best of tempers, and but for the intervention of a naval lieutenant there might have been an "incident."

On April 20 the second speed race was to be flown, for which Maddalena had brought over his Savoia racer, only to come to grief outside the harbour. In the morning the weather was clear, but during the day it became more and more overcast. Nevertheless both Lalouette on the Spad and Poirée on the Caudron "C.51" came out for the speed over a nautical mile and for their altitude tests. Lalouette covered the nautical mile in 48¾ secs., and Poirée in 49⅜ secs. Lalouette then disappeared in the mist and clouds for his altitude test, and was away for about an hour. He then hove in sight again, and after making a circuit alighted in front of the *Tir aux Pigeons*, puncturing one of his floats. The machine commenced to sink, and, with his altimeter on his arm Lalouette climbed on top of the *fuselage*, from where he was rescued by boats and the machine taken in tow.

In the afternoon the weather had got very bad, but Maicon and Poirée came out on their Caudrons and started on the speed race, Poirée getting away first. As Maicon was taking off it was thought that one of his engines was not running very well, but he started off, evidently hoping that it would pick-up on the way. About an hour went by without news of Maicon; then a telephone message related that he was down at Antibes, and that he and his mechanic were safe. When Poirée returned, after completing his flight over the course, he related having seen, after he had turned at Cannes and was on his way back to Monaco, the other Caudron going down toward Antibes, and then, on touching the sea, heel over to port and commencing to settle. As he knew that the door of the cabin was on the starboard side, he felt sure the occupants would easily be able to leave the machine, and consequently he did not alight to offer assistance. When, later, Maicon returned to Monaco he explained what had happened. A spark from the starting magneto, he thought, had set on fire something or other, which he did not observe at the time. When near Antibes he suddenly discovered the fire, which had spread to the woodwork, and shouted to the mechanic to attempt to put it out. Blinded by the smoke, he could not see to make a landing, and the machine side-slipped into the sea near Antibes. And thus ended the thirteenth Monaco meeting.

M. Laurent-Eynac is Satisfied

IN an interview with our French contemporary *L'Auto*, M. Laurent-Eynac, the French Secretary of State for Air, expressed himself very satisfied with the Monaco meeting, saying that Maicon's flight to Corsica and back in very bad weather proved that the seaplane is a sea and airworthy craft, and that Maicon's flight had blazed the trail for the first France-Tunis air line. The first stage of this route, he said, will be from Antibes to Ajaccio, the second from Ajaccio to Antiocho in Sardinia, the third and most difficult from Antiocho to Bizerta in Tunis. Antibes will thus become a very important seaplane base for commercial air lines, and will be the air port of Cannes and Nice.

THE Postmaster-General has now issued in sheet form a résumé of the present arrangements for air mail services during the summer season, 1921. It is a healthful sign, and the information should be helpful to the public, if the leaflets are adequately distributed, so that our commercial houses may realise the advantages obtainable by using the air-post.

Elaborating the short par. last week *re* these Air Mails, the following are the full regulations—slightly re-arranged by ourselves. The heading is the little sketch-block which appears in the official leaflet:—

1. General Regulations

1. **Packets admissible.**—All classes of letter packets, *i.e.*, letters, postcards, packets of printed papers and commercial papers, and samples, are admitted to the Air Mail services. Any letter packet may be registered. Neither insured packets nor parcels are admitted.

2. **Facilities for posting**—Air Mail packets may be handed in for registration at any Post Office, or, if registration is not required, may be posted in any public posting-box. In addition, special arrangements have been made to accept packets for the Paris service *over the counter*, at a later hour than would normally be possible, at the following offices in London, viz.: London Chief Office (King Edward Street, E.C.), Threadneedle Street and Lombard Street Branch Offices, E.C., Western Central District Office (New Oxford Street, W.C.), Western District Office (Wimpole Street, W.), South-Western District Office (Victoria Street, S.W.), Charing Cross and Parliament Street Branch Offices. (*As regards latest times of posting*, see *paragraphs 8 and 9.*)

3. **Special "Air Mail" label.**—Every packet intended for transmission by Air Mail should bear in the top left-hand corner a special blue label bearing the words "By Air Mail." The label enables each packet to be specially selected during the process of sorting. It can be obtained free of charge at any head or branch Post Office, or on written application from the Secretary (Air Mails), General Post Office, London, E.C. 1. In the absence of a label, the cover of the packet should be prominently marked "By Air Mail" in manuscript in the top left-hand corner; but the use of the label is desirable in order that any risk of exclusion from the next Air Mail may be avoided. Any additional special marking required, *e.g.*, on packets for Morocco (*see* paragraph 6) should be inserted *immediately beneath* the label (or manuscript equivalent).

4. **Express Delivery.**—If express delivery in the country of destination is desired as well as transmission by air, an express fee of 6*d.* per packet must be prepaid in the same manner as the air fee (*see* paragraph 7). Packets intended for express delivery should be prominently marked with the word "Express" immediately below the words "By Air Mail" on the blue label (or manuscript equivalent) referred to in paragraph 3. The delivery of Air Mail packets by the express service is carried out in France, Holland, Belgium, and certain other foreign countries (of which a list may be seen on application at any Post Office) where the express delivery of ordinary packets is undertaken.

2. Routes and Frequency of Service; Advantages Offered

5. Letters and other letter packets (*see* paragraph 1) can be posted each weekday in all parts of the United Kingdom for transmission by any of the Air Mail services shown below:

Service 1, London–Paris; Service 2, London–Brussels; Service 3, London–Amsterdam; Service 4, Rotterdam–Bremen–Hamburg–Copenhagen, with branch Bremen–Berlin; and Service 5, Toulouse–Casablanca, on four days a week.

6. These air services, working in connection with ordinary train and steamer services, make it possible to reduce the time of transmission of letters from this country to many parts of Europe and to some extra-European countries. Following a general idea is given of the advantages offered by each service (without express delivery, as to which *see* paragraph 4), the times following the name of service being the time the mail closes in London (G.P.O.) each weekday. More detailed information as to the time occupied in the transmission of an Air Mail packet to any particular destination can be obtained on application to the Secretary (Air Mails), General Post Office, E.C. 1.

1. London–Paris (11 a.m.) for Paris. Delivery Paris evening of same day. Delivery most of France following morning. Connection for Spain, Portugal, Switzerland, Italy with night mail trains from Paris same day. (Up to 24 hours saved in time.) Connection for India, Aden, Ceylon, China, East Africa, Mesopotamia, Straits Settlements with steamer leaving Marseilles following day. (One week saved.)*

Connection for Australia† with mail steamer leaving Marseilles or Toulon following day (saving up to a fortnight). Connection for Egypt, Sudan, Palestine, and Syria† with Indian Mail steamer or with French packets (saving one or more days).

2. London–Brussels (8.15 a.m.) for Brussels. Delivery Brussels afternoon of same day. Delivery Antwerp and some other places in Belgium evening of same day. Delivery rest of Belgium following morning.

3. London–Amsterdam (8.15 a.m.) for Amsterdam, The Hague, Rotterdam. Delivery evening of same day. Delivery rest of Holland evening of same day or following morning. Connection for North and Central Germany with afternoon mail train from Amsterdam same day (saving 7-24 hours). Same for Sweden and Finland‡ (saving 24 hours).

4. Rotterdam–Bremen, etc. (5.30 p.m.). Delivery Bremen, Hamburg, Berlin following evening.§

For Copenhagen and Denmark†† generally (saving up to 36 hours). Connection for Sweden and Finland‡ with night mail train from Copenhagen (saving 24 hours). Connection for Eastern Baltic countries except Finland with night mail train from Berlin (saving 24 hours).

5. Toulouse–Casablanca (6.30 a.m. weekdays, 6 a.m. Sundays)‖. Delivery Morocco evening of second day (saving *1 or 2* days).

The aeroplanes leave Toulouse only on Monday, Wednesday, Thursday and Saturday, and the latest mails to connect are those closed in London on the preceding Sunday, Tuesday, Wednesday and Friday morning. Packets posted on any day of the week in London or the provinces should, however, normally be accelerated in transmission.

3. Air Mail Fees

7. A special Air Mail fee, in addition to the ordinary foreign (or Imperial) postage rate, is payable by means of postage stamps on each Air Mail packet, as below:—

Service 1, London–Paris, Air Mail fee, 2*d.* per oz.; Service 2, London–Brussels, 4*d.* per oz.; Service 3, London–Amsterdam, 4½*d.* per oz.; Service 4, Rotterdam–Bremen, Hamburg, Berlin, *or* Copenhagen, 4½*d.* per oz.; Service 5, Toulouse–Casablanca, 5*d.* up to ½ oz., 11*d.* up to 3½ oz., 6*d.* additional for each additional 3½ oz. up to maximum of 2*s.* 11*d.* for 17½ oz.

Fees for registration and express delivery, where these services are required, are additional.

IMPORTANT.—*Any packet which is not fully prepaid with the appropriate Air Mail Fee will not be sent by Air Mail.*

4. Latest Times of Posting

8. **London.**—The time of closing each mail at the G.P.O. is liable to change, of which due notice will always be given in the newspapers when possible. Precise information as to the latest times of posting for the Paris service at the special offices mentioned in paragraph 2 may be obtained by enquiry at those offices. The Secretary (Air Mails), G.P.O., London, E.C. 1, will furnish, on application, a statement showing the latest times of posting in London for all the Air Mail services.

9. **Provinces.**—Letters must be posted in time to be forwarded in mails for London conveyed by trains due to reach the London terminus well before the hour of closing the Air Mail at the G.P.O. Precise information should be sought from the local Head Post Office.

* Packets for these places are sent by Air Mail on *Friday only* (for Australia only in those weeks in which there is an ordinary Mail to that country *via* Suez). As the Air Mail connection may fail in bad weather, the Air Service should not be used except for packets which cannot be posted in time for the ordinary mail leaving London on Thursday evening.

† Or any other week-day except Wednesday and Friday.

‡ Air Mail packets for Sweden and Finland can be sent either by Service 3 or by Service 4. In Service 3 transmission is by air to Holland, and thence by train; in Service 4 transmission is by ordinary night mail to Holland, and thence by air. Packets which can be posted in time for Service 3 should not be retained for Service 4.

§ Bremen for the districts of Bremen and Oldenburg; Hamburg for the districts of Hamburg, Kiel and Schwerin, for Schleswig-Holstein and Mecklenburg; Berlin for the rest of central and eastern Germany.

†† The opening of the air route Hamburg-Copenhagen, has been postponed at the last moment; but Air Mail letters for Denmark can still obtain an advantage of 3 to 24 hours over the ordinary service, whether sent by the morning Air Mail to Amsterdam or by the night service *via* Rotterdam. The latter service will, for the time being, offer no advantage for letters to Sweden and Finland.

‖ Packets must be plainly marked immediately below the Air Mail label (or manuscript equivalent), "Par avion de Toulouse."

FLIGHT

NOTICES TO AIRMEN

France : Enlargement of Aerial Corridor ; Aerodromes, etc.

NOTICES to Airmen Nos. 98 and 111 of 1920 are amplified and amended as follows :—

1. *French Aerial Corridor*

The aerial corridor for machines entering or leaving France, which, according to the Anglo-French Air Navigation Agreement of November 23, 1920, previously included that portion of the French coast between Boulogne and Calais, has now been enlarged.

It will in future extend *from Etaples to the Belgian frontier.*

2. *Civil Aerodromes and Seaplane Stations*

(i) *Additions*

The following aerodromes belonging to the Service de la Navigation Aérienne are now available :—

(*a*) ORLY.—*Position :* Latitude 48° 44′ N., Longitude 2° 23′ E., situated about 13 kms. (8 miles) south of Paris, at a height of 89 metres (290 feet) above sea level. *Dimensions for landing :* 800 × 750 metres. *Accommodation, Supplies, etc. ;* Two hangars, 34 × 30 × 8.5 metres, two hangars 20 × 30 × 4.5 metres ; facilities for repairs, and castor oil are available, but not petrol.

(*b*) STRASBOURG–NEUHOF.—*Position :* Latitude 48° 33′ N., Longitude 7° 46′ E., situated 3½ kms. (2 miles) S.S.E. of Strasbourg, and 1½ kms. (1 mile) N. of the village of Neuhof at a height of 139 metres (460 feet) above sea level. *Dimensions for landing :* 500 × 50 metres. *Accommodation, Supplies, etc. :* Two Bessonneau hangars, 26 × 28 metres, one Bessonneau hangar, 20 × 28 metres ; petrol and oil are available. There are no facilities for repairs.

(*c*) VALENCIENNES.—*Position :* Latitude 50° 20′ N., Longitude 3° 31′ E., situated 1½ kms. (1 mile) south of Valenciennes at a height of 80 metres (260 feet) above sea level. *Dimensions for landing :* 500 × 450 metres. *Accommodation, Supplies, etc. :* One hangar, 21 × 21 metres, is available. There are no facilities for repairs and no supplies.

Note.—The last three lines of para. 1 of Notice to Airmen No. 111 of October 22, 1920, are accordingly cancelled.

(ii) *Amendments.*

(*a*) LE BOURGET.—*Obstructions :* (1) Scaffolding, 30 metres (98 ft.) high, has been put up in the north-east part of Le Bourget Aerodrome close to the Flandre road between the hutments belonging to the Administration and the last hangars on the north-east of the aerodrome.

These obstructions are marked : *By day :* By means of streamers hoisted at the top of the highest poles. *By night :* By means of danger lamps (white light) placed on the aerodrome at a height of 2 metres (6½ ft.) and at a distance of 50 metres (55 yards) from the scaffolding.

(2) An embarkation stage and a platform for swinging compasses are being constructed between a point 500 metres (547 yards) east of the landing circle and the Flandre road (see plan of Le Bourget Aerodrome attached to Notice to Airmen No. 98). These obstructions are marked : *By day :* By two streamers. *By night :* By two danger lamps (white light).

(*b*) MAUBEUGE.—As this ground belongs to the Service de la Navigation Aérienne and not to the military authorities, the note appended to para. 2 of Notice to Airmen No. 9 of 1921 is cancelled. The remainder of the paragraph in question, to the effect that the ground is unfit for use even in emergency, is still applicable.

(*c*) ANTIBES (Seaplane Station).—*Wind Indicator.*—A red and white wind indicator has been installed on the north gable of the hangar.

3. *Telephone Numbers.*

The following is a list of telephone numbers of French aerodromes and wireless stations of the Service de la Navigation Aérienne, corrected to February 15, 1921 :—

Antibes (Number 2-69) ; Bayonne (6-82) ; Bordeaux (Mérignac 16) ; Le Bourget (Nord 80-90, Inter 374) ; Dijon (239) ; Lyon (22-81) ; Marseilles (Marignanc 20) ; Maubeuge (70) ; Montélimar (1-88) ; Nimes (693) ; Orly (Gobelins 47-65, Inter 834) ; Perpignan (Observatoire 4-90) ; St. Inglevert (Calais 8-89) ; Strasbourg (13-93) ; Toulouse (Latécoere 11-70).

(No. 36 of 1921.)

Denmark : Copenhagen Seaplane Station

1. NOTICE to Airmen No. 105 of 1920 is amplified as follows :—

Copenhagen Seaplane Station.—An aerial light signal is now exhibited by request, or whenever aircraft are expected after dusk, from the eastern end of the wooden bridge. The characteristics of the light are the letters ST in the Morse code (- - - — —), the period being 15 seconds, as follows :—

Flash (1 second), eclipse (1), flash (1), eclipse (1), flash (1), eclipse (3), flash (3), eclipse (4).

Two flares have also been set up to enable aircraft to navigate up the centre of the channel leading to the slipway. The first flare is white and is placed close to the slipway, and the second is red and is placed on the roof of a hangar.

Note.—A plan of this aerodrome was given in Notice to Airmen No. 105 of 1920.

(No. 37 of 1921.)

ROYAL AERONAUTICAL SOCIETY NOTICES

Elections.—The following members were elected in the various grades as shown at a Council Meeting held on April 19. *Fellows.*—Maj. T. M. Barlow, A.M.Inst.C.E. ; C. I. R. Campbell, M.I.N.A. *Associate Fellows.*—H. E. Hudson, H. J. Wilkins, A.M.I.Aut.E. *Students.*—J. D. Campbell, G. Chiverton. *Members.*—W. M. M. Clark, A Newman. *Associate Member.*—Flight-Lieut. S. T. Freeman. *Foreign Member.*—Cmdr. H. T. Dyer, U.S.N.

Council.—Sir Mackenzie Chalmers, K.C.B., C.S.I., has been co-opted by the Council, in accordance with the provisions of Rule 13, to serve as a Member in the room of Maj.-Gen. Sir R. M. Ruck, K.B.E., C.B., C.M.G., who vacates his seat (with power to attend) under the provisions of Rule 18 (*d*).

Committees.—At the April meeting of the Council the following members were nominated to serve on the Committees named. The Chairman and Vice-Chairman are *ex-officio* members of all Comittees. *Candidates Committee.*—Dr. L. Bairstow, Wing-Cmdr. T. R. Cave-Browne-Cave, A. E. L. Chorlton, Capt. G. de Havilland, Maj. H. Grinsted, Prof. B. Melvill Jones, W. O. Manning, Maj. G. H. Norman, N. A. V. Piercy, Dr. A. J. Sutton Pippard, Flight-Lieut. J. E. M. Pritchard, J. L. Pritchard and Maj. H. E. Wimperis. *Publications and Library.*—Dr. L. Bairstow, Capt. W. S. Farren, Capt. F. M. Green, Sqdn.-Ldr. R. M. Hill, Maj. A. R. Low, J. L. Nayler, Lieut.-Col. H. W. Outram, Flight-Lieut. J. E. M. Pritchard, A. V. Roe, Maj. H. E. Wimperis, and the Editor.

W. LOCKWOOD MARSH,
Secretary

The Prince of Wales Hears Sir Ross Smith

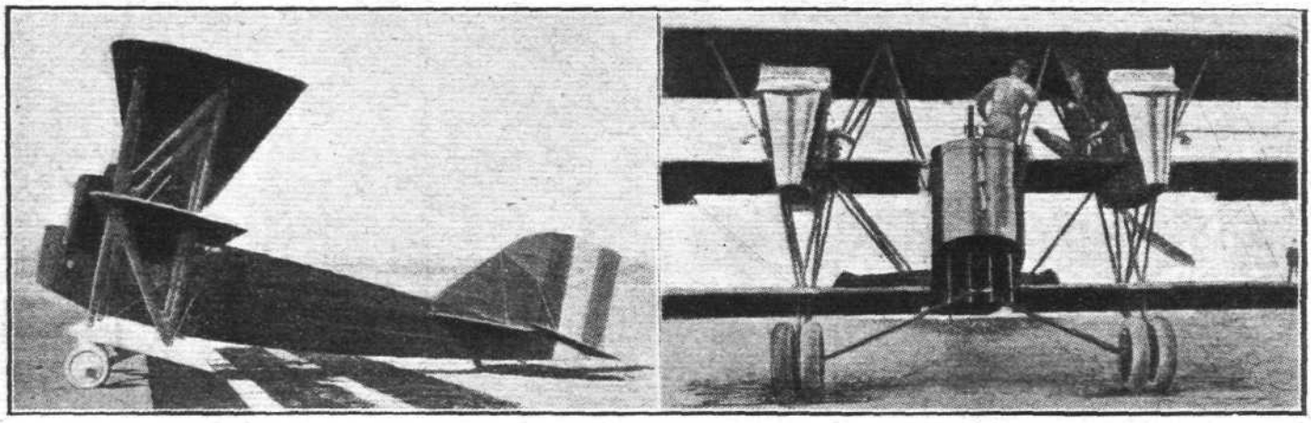
THE Prince of Wales, attended by Captain the Hon. Piers Legh, paid a visit to the Philharmonic Hall on Tuesday afternoon to hear Sir Ross Smith's lecture on the England–Australia Flight. This interesting lecture is well worth the trouble of going to hear, and we have no hesitation in urging those of our readers who have not yet been, to do so if possible.

Civil Aviation in Sweden

IT is probable that the air mail service between Malmo, Copenhagen, Warnemunde, Berlin, and between Malmo, Copenhagen, Hamburg, Amsterdam and London, which was run last autumn by the Swedish Air Traffic Co., will be re-opened during the coming spring.

Proposals are being considered for establishing a commercial airship service from Stockholm to either London, Paris, Geneva, Berlin or Vienna. The journey from Stockholm to London is calculated to take about 16 hours, and the cost per passenger is provisionally estimated at about Kr. 750.

THE U.S. "G.A.X." GROUND ATTACK TRIPLANE



THE U.S. "G.A.X." GROUND ATTACK TRIPLANE: Side (left) and front (right) views, the latter showing armoured *fuselage* and engine *nacelles*.

THE accompanying illustrations, which we reproduce from our American contemporary *Aviation*, show one of the ten ground attack triplanes forming a contract with the Boeing Airplane Co., of Washington, U.S.A., placed by the U.S. Army Air Service.

This machine was built to the designs of the Engineering Division of the Air Service, and the general characteristics are as follows. It is a twin-engined triplane of more or less conventional design, the main distinctive features consisting of the armoured front half of the *fuselage*, armoured engine housings, and the sloping N interplane struts. The latter arrangement is employed in order to give the same overhang on all wing extremities, the planes decreasing in span from top to bottom.

The machine carries one pilot and two gunners, operating in all eight machine-guns and one cannon. These three occupants are practically enclosed in armour, which, together with that protecting the engines, weighs about 2,000 lbs. The pilot, who occupies the front cockpit, operates one 37-mm. cannon, a row of four Lewis machine-guns firing forward and downward, and one machine-gun firing upward and over the wings. [This pilot would do well in a jazz band!—ED.] The gunners' cockpit at the back has two Lewis guns firing downward to the rear through a tunnel in the *fuselage*, and one shooting up and over the wings. Bomb gear may also be fitted. Aft of the rear gun cockpit the *fuselage* is of veneer construction.

The weights and performance of the U.S. G.A.X. are as follow :—

Weight empty (inc. water)	..	7,532 lbs.
Useful load : Petrol	.. ..	615 ,,
Oil	.. .. ..	60 ,,
Crew (3)	.. ..	540 ,,
Armament	.. ..	933 ,,
Equipment, etc.	..	140 ,,
Total weight fully loaded	..	9,820 lbs.
Weight/h.p.	.. .. ..	11.2 ,,
Weight/sq. ft.	.. .. ..	9.6 ,,

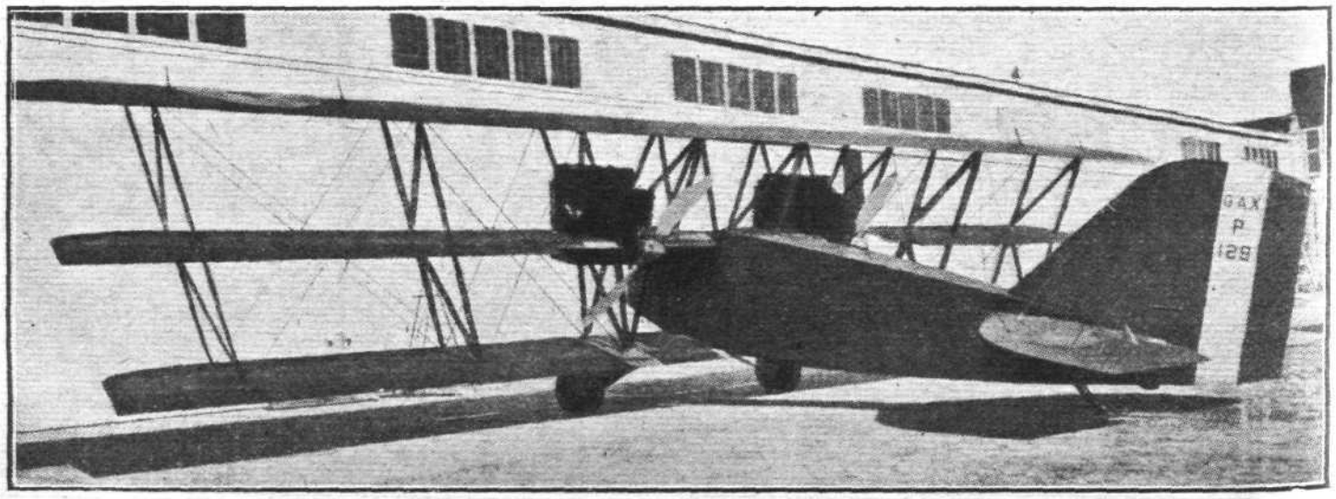
Performance. In Climb.				In Horizontal Flight.	
Altitude, ft.	Time, min.	Engine, r.p.m.	Climb, ft./min.	Speed m.p.h.	Engine r.p.m.
000			600	105	1,800
2,000	3·7	1,665	495	103·7	1,780
4,000	8·2	1,660	390	102	1,760
6,000	14·1	1,650	285	99·5	1,735
8,000	22·8	1,635	185	95·0	1,700
11,500*	36·1	1,625	100	89·5	1,665

* Service ceiling.

Landing speed 50 m.p.h. Minimum speed 63·6 m.p.h. (at sea level).

The top plane has an overall span of 65 ft. 6 ins., that of the lower plane being 58 ft. 6 ins. The chord is 6 ft. 8 ins. for the top, and 5 ft. 8 ins. for the middle and lower planes; the gap is 5 ft. There is no dihedral angle on the top plane, but the middle and lower planes have $1\frac{1}{2}°$ and 3° respectively; the angle of incidence of all planes is $1\frac{1}{2}°$. There is no stagger and no sweepback. *Ailerons* are inserted in the upper and middle planes only; the area of the upper *ailerons* is 36.8 sq. ft., and of the middle ones 21.8 sq. ft., 10 per cent. of each being balancing area. The total supporting surface of the planes is 1,016 sq. ft. The tail consists of a divided triangular stabilising surface of 53.3 sq. ft., to the trailing edge of which are hinged balanced elevators of 36.4 sq. ft. The balanced rudder (45.8 sq. ft.) is hinged to a vertical fin. Dep. control is used.

The landing chassis consists of a laminated spruce V located under each engine *nacelle*, braced by a steel tube running from the axle to the centre of the bottom of the



THE U.S. "G.A.X." GROUND ATTACK TRIPLANE: Three-quarter rear view.

fuselage; each unit has a pair of wheels, and the weight of the two units complete is 385 lbs.

Two 12-cylindered Liberty engines, each developing 435 h.p. at 1,800 r.p.m., are installed, with Delco ignition, and Zenith carburettors; they drive direct four-bladed propellers of special design. The radiators, mounted in the nose of each *nacelle*, are fitted with shutters. There is a short exhaust-pipe for each cylinder.

PEKING–SHANGHAI AIR-MAIL

FROM time to time we have given particulars of the arrangements maturing in connection with the air service which is being inaugurated between Peking and Shanghai. The Peking correspondent of *The Times* last week summarises the present position of this very promising undertaking. The Service is to be opened on June 1, under plans prepared with the advice of Group-Capt. F. V. Holt, R.A.F., a highly-experienced aviation officer seconded from the British Service, the Aeronautical Department.

The route selected offers special facilities which make it more suitable than any other for a beginning. Landing-places are easily arranged throughout; the absence of hills simplifies flying; there are meteorological stations at each end whence pilots may inform themselves of the weather conditions, while there is the railway as a stand-by in case of accident. Incidentally, the telegraph along the railway makes it possible to dispense with wireless on the aeroplanes. The route, in fact, is the easiest and therefore the best from the point of view of speedily establishing confidence.

The whole distance is 785 miles, divided into three stages —to Tsinanfu, 245 miles; to Nanking, 360 miles; and Shanghai, 180 miles. Besides the points mentioned there will be places of call at Tientsin and Hsuchowfu. It is planned to cover the whole distance, including stops, in nine hours. In addition to regular aerodromes at the stations, there will be eight emergency landing-places, where petrol and oil can be obtained and pilots can telegraph for assistance. The total capital expenditure on buildings is put at $165,000 and the monthly cost for a daily service at $40,000. Revenue for full loads all the time would be more than double the running expenses, but the Department, for a commencement, will be very satisfied to make the service pay its way. As Chinese pilots are not yet available, a number of capable foreign airmen have been engaged in Europe and America. Earlier flights will be restricted to the transport of mails, and passengers will not be carried until the safety of the service has been amply demonstrated. Naturally the greatest care will be taken to avoid accident, for any smash involving life would prejudice aviation for years to come.

With the finest aeroplanes known, proved pilots in charge, easy going all the way, and ample funds for expenses, there is every prospect of a successful inauguration of the service this summer. Only one thing can kill it, and that is a renewal of the fatuous and criminal strife between the militarists who are at present masters of the country.

It should be noted that this is a country wherein communications are either highly primitive or painfully deficient. With an area and population nearly as great as all Europe, China has only 6,500 miles of railway, and almost no road system suitable for wheeled traffic. She has magnificent waterways, but they are deteriorating rather than improving. Journeys into the interior that under present conditions occupy anything from a week to three months might be accomplished in a few hours by aeroplane.

The Chinese are becoming alive to this possibility, and, as any serious improvement in the facilities for travel by other means is out of the question for years to come, they intend to give the aeroplane a trial. Let there be established a sense of security in flying, and there can be no doubt of the brilliant prospects of aviation in this country.

THE NEW HANDLEY PAGE MONOPLANE

First Machine Designed for Slotted Wing

SINCE the first mention of the Handley Page slotted aerofoil was made in the Press, aeronautical circles have been much occupied with the subject, and Mr. Handley Page's lecture was looked forward to with the keenest anticipation. When the H.P. slotted wing was first demonstrated on a D.H. 9 at Cricklewood, there were many who were inclined to be a little sceptical regarding the value of the new wing, forgetting that the slot itself was not of the best shape, while the alteration to the standard D.H. 9 wing section was necessarily of a somewhat crude nature.

Even that comparatively "harrytated" affair showed a most extraordinary alteration in the climbing and gliding angles of the machine, as well as in the getting-off and alighting speeds. Tests of the wing with slots closed could not be carried out on that machine, as the auxiliary aerofoil was rigidly connected to the leading edge of the main 'planes.

In the new machine, which has been designed especially for the wing, the slot will be capable of being opened and closed at will.

As the machine is necessarily to be regarded as an experimental one, we cannot say very much about it at present. It may, however, be stated that it will be a monoplane with three-ply covered wings. The engine is to be of 350 h.p., probably a Rolls-Royce "Eagle" low-compression engine, and according to wind-tunnel tests and estimated figures of weights, etc., the speed should be considerably above 100 m.p.h., while the cabin will seat 10–12 passengers.

When it is realised that on the majority of modern machines the power expenditure is between 50 and 60 h.p. for each passenger carried, while the H.P. monoplane is to carry a passenger for each 30 h.p. or so, it will be seen that if the new machine comes up to expectations it will mark a real step forward in the economy of commercial flying.

As regards details of the wing construction and slot operating gear, we are not at present permitted to say anything, but the gear is of quite a simple nature and promises to work very well in practice, so that there is no reason to anticipate any trouble on that score. The test flights of the new machine will be awaited with more than ordinary interest.

An Aeromarine Flying School

IT is proposed to open an elaborately equipped flying school at Keyport, New Jersey, some time this spring, where tuition on both land and water 'planes will be given, in addition to instructional courses in the theory of flight, construction, rigging, engines, etc. The plant of the Aeromarine Plane and Motor Co., who are establishing this school, includes 66 acres with 16 buildings, a club house, restaurant, engine plant, assembly building, a seaplane station, and a flying field for land machines, and is thus well suited for such a venture.

Aircraft Insurance in the U.S.A.

ACCORDING to the American Press, the following American companies are writing aircraft insurance in connection with (1) fire; (2) theft; (3) collision; (4) property damage; (5) public liability; (6) personal accident; (7) compensation; (8) passenger hazard (life and accident). The Travellers Insurance Co. and the Travellers Indemnity Co., Hartford, Conn., insure Nos. 4, 5, 6, 7, 8; Aetna Life Insurance Co., Aetna Casualty and Surety Co., Automobile Insurance Co., Hartford, Conn., 1, 3, 4, 5, 6, and 7; Home Insurance Co., 56, Cedar Street, New York City, 1, 2, 3, and 4; Queen Insurance Co. of America, 84, William Street, New York City, 1, 2, 3, and 4; National Liberty Insurance Co. of America, 62, William Street, New York City, 1, 2, and 3; London Guarantee and Accident Co. (c/o F. W. Lawson, Manager, Chicago, Ill.), 1, 2, 3, 4, 5, and 6.

Japan Multiplying Pilots

FROM Tokio news is sent that the Japanese authorities are very busy accumulating pilots. From the different schools it is stated an average of 36 pilots every 5 weeks are being turned out as efficient, it being arranged that the supply of machines keeps pace with the personnel available.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN APRIL 10 AND APRIL 23, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying: Mails	No. of flights carrying: Goods	No. of journeys completed†	Average flying time	Fastest time made by	Type and No. (in brackets) of Machines Flying
						h. m.		
Croydon-Paris	29	92	6	23	26	2 32	Spad F-CMAY (1h. 51m.) ...	B. (6), Br. (1), D.H.18 (2), G. (4), Sa. (2), Sp. (2), V. (1).
Paris-Croydon	30	135	12	20	25	3 6	**Spad F-CMAY** (1h. 54m.) ...	B. (5), D.H.18 (2), G. (4), Sa. (2), Sp. (2), V. (1).
Cricklewood-Paris ...	7	55	6	5	7	3 1	D.H.9 G-EAUI (2h. 20m.) ...	D.H.9 (1), H.P. (3).
Paris-Cricklewood ...	7	53	—	1	5	4 19	H.P. G-EATM (3h. 15m.) ...	D.H.9 (1), H.P. (3).
Croydon-Brussels ...	15	15	7	10	14	2 46	D.H.4 O-BATU (2h. 4m.) ...	Av. (2), D.H.4 (3), D.H.9 (3), G. (1).
Brussels-Croydon ...	14	19	11	11	11	3 2	D.H.9 O-BEAU (2h. 14m.)...	D.H.4 (2), D.H.9 (3).
Croydon-Amsterdam ...	8	8	5	8	8	4 5	Fokker H-NABH (3h. 31m.)	F. (4).
Amsterdam-Croydon ...	10	12	8	9	9	3 14	Fokker H-NABM (2h. 19m.)	F. (4).
T'otals for two weeks...	120	389	55	87	105			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.
‡ Including certain diverted journeys.

Av. = Avro. B. = Breguet. Br. = Bristol. Bt. = B.A.T. D.H.4 = De Havilland 4, D.H.9 (etc.).
F. = Fokker. Fa. = Farman F.50. G. = Goliath Farman. H.P. = Handley Page. N. = Nieuport. P. = Potez.
Sa. = Salmson. Se. = S.E.5. Sp. = Spad. V. = Vickers Vimy. W. = Westland.

The following is a list of firms running services between London and Paris, Brussels, etc., etc. :—Co. des Grandes Expresses Aériennes ; Handley Page Transport, Ltd. ; Instone Air Line ; Koninklijkie Luchtvaart Maatschappij ; Messageries Aériennes ; Syndicat National pour l'Étude des Transports Aériens ; Co. Transaérienne.

LONDON TERMINAL AERODROME, CROYDON

Monday evening, April 25

THE London air-port is becoming more luxurious every week. The Instone Air Line have now equipped a waiting-room for passengers which surely rivals any that our railway companies provide. Several settees and easy-chairs, made, understand, by the Central Aircraft Company at Kilburn, grace this waiting-room. If it were possible to provide refreshments here, I am afraid the Trust House would be the loser.

While still on the subject of luxury, one may mention that a billiard-table is now installed in the public-bar of Trust Houses, and the aerodrome tennis enthusiasts report that the condition of the hard tennis-court is rapidly improving.

An analysis of Continental air traffic returns for the week ending Friday, April 22, reveals some very interesting figures. The passengers carried had increased from 54 in the corresponding period of last year to 193 this year, but the machines used to handle this growing traffic had only increased by 10 —*i.e.*, from 50 to 60. A survey of the passengers carried by the British and foreign aeroplanes showed 108 by British as against 85 by foreign, the average loads being nine passengers per British machine and two per foreign machine. It is only fair, however, to point out that Capt. Greig, who is now London manager for the Belgium S.N.E.T.A., as well as the Messageries Aériennes, is greatly handicapped by the limited capacity of his aeroplanes, the majority being converted war-'planes with accommodation for only from two to four passengers. The British machines are all big 'planes seating between 8 and 12 passengers each.

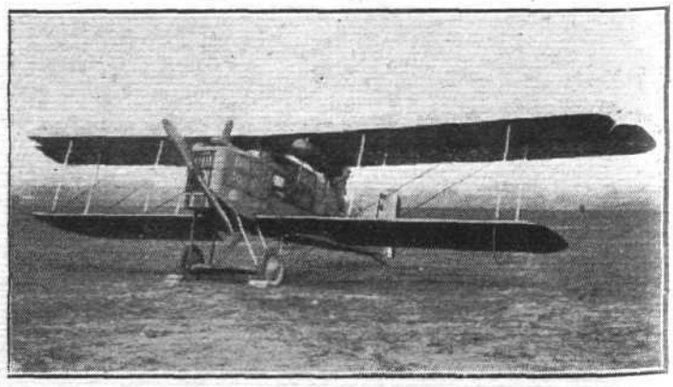
An amusing incident occurred in connection with the accounts, in certain newspapers, to the effect that a pig had arrived by air from Amsterdam. As a matter of fact this pig did not materialise, but the Board of Agriculture is firmly convinced that some pig—breed and nationality unknown—has arrived in the country without being examined by their inspectors, and is now spreading broadcast foot-and-mouth disease, or rabies, or whatever the fashionable disease for pigs may be at the moment. An official of the Board of Agriculture has been down at the aerodrome investigating this strange disappearance with all the skill of a Sherlock Holmes.

Night tests of the aerodrome lighting were carried out on Thursday by Handley Page 0-400, which flew over from Biggin Hill. This is much more satisfactory, and certainly cheaper, than bringing an airship all the way from Pulham. Capt. Roach, the pilot of the Handley Page, made two perfect night landings, one alongside the petrol flares, and the other down the beam of a searchlight.

Mr. Winter visited the aerodrome on Friday. He is now on the aviation staff of Messrs. Napier, and will be a frequent visitor to Croydon. Mr. Hall, Napier's engine expert on the aerodrome, is still busy taking photographs of Napier engines from every conceivable position.

Friday was quite an eventful day. At 12.30 p.m. there

ARRIVED FROM PARIS : Passengers alighting from the "D.H. 18 G-EAUF" of the Instone Air Line at the Croydon terminal.



***One of the French London-Paris Service Machines:* The Breguet "F-CMAI."**

were four "air expresses" lined up outside the Customs House—a French "Goliath," a British "D.H. 18," a Belgian-owned "D.H. 9," and a French "Salmson." Each passenger appeared to have brought his or her family to see them off, and quite a collection of cars was drawn up on the tarmac. Mr. Barnard, of the Instone Air Line, pointed proudly at the clock when the "City of Paris" got away exactly on time.

A Bristol "Tourer," purchased by a Mr. Bayo for private use in Spain, left for Paris on Saturday, piloted by Mr. Forson. The weather was particularly vile, and only four out of eleven scheduled machines completed the journey. Mr. Powell, on a "D.H. 18," was the only arrival from the Continent.

M. Bouderie, of Grands Express, tells me that, commencing immediately, his firm will run four "Goliaths" in each direction between London and Paris every week. They have now a fleet of eight Farman "Goliaths."

An early-morning newspaper service to and from Paris will be started by Messageries Aériennes on May 2. French newspapers will be on sale in London by breakfast-time, and, by the dispatch of papers from Croydon at 6.30 a.m., English residents in Paris will have their London newspapers by 9 a.m.

A new building has been erected for the meteorological service, and is now almost ready for occupation. It will contain a "thunderstorm detector," worked on the principles of wireless telegraphy.

The joy-riding firms are having rather a bad time. The week-end weather is very much against them just now, but, all the same, some hardy "joy-riders" took flights on Sunday. Mr. Shaw took one of the Surrey Flying Services "Avros" over the Cup Final to obtain aerial photographs; but, unfortunately, these were spoilt by the mist. Capt. Muir is busy arranging to give joy-rides at Norwood Junction.

Mr. Earle, late of Aircraft Transport and Travel, has now joined Air Express, Ltd., at Pall Mall, and is still seen at times at the 'drome.

The "remains" of Aircraft Transport and Travel are still in evidence, but are now reduced to one storekeeper and his stock. These stores, so extensive was the original stock, have developed into a sort of universal emporium all the present transport companies buying from them. The Airco 16's are still under canvas, but persistent rumours are current as to placing them in commission again in the near future.

On Monday afternoon, atmospheric conditions improving, there was a regular procession into Croydon of machines which had been weatherbound since Saturday on intermediate aerodromes along the various Continental "airways."

Married

Squadron-Leader A. G. HORSLEY CARR, R.A.F., eldest son of Mr. and Mrs. William Horsley Carr, of Barnsley, Yorkshire, was married on April 19, at St. Stephen's, Gloucester Road, to the Hon. Mrs. HAMILTON SIMPSON, widow of Lieut. J. C. Simpson, and daughter of Georgina Lady Belhaven and Stenton.

Major CYRIL HERBERT GARDNER, A.F.C., son of the late Colonel A. S. Gardner, V.D., D.L., R.A., of Neath, was married on April 14, at the Parish Church, Baglan, to EMY NESTA THOMAS, second daughter of the late Dr. J. W. Thomas and of Mrs. Thomas, The Wern, Neath.

Flying Officer R. D. LAMBERT, R.A.F., was married on April 21, at St. Stephen's Church, West Ealing, to MABEL, only daughter of Mr. and Mrs. WM. BOURN RUTTER, Holmbury, Mortimer Road, Ealing.

To be Married

A marriage has been arranged, and will shortly take place very quietly, between Air-Commodore C. A. H. LONGCROFT, C.M.G., D.S.O., A.F.C., R.A.F., and MARJORY, widow of Capt. W. D. HEPBURN, Seaforth Highlanders.

The engagement is announced of Flying Officer CHRISTOPHER W. H. MOLLER, R.A.F., eldest son of Mr. W. H. Moller, of Santfoins, Cambridgeshire, and ELIZABETH MAUD GWYNNEDD (BETTY), eldest daughter of Mr. and Mrs. KERR, of Maesmor, Denbighshire, and Faldonside, Cromer, Norfolk.

The engagement is announced between HAROLD HENRY DE BAILLOU MONK, M.C., A.F.C., son of the late Lieut.-Col. Charles Monk, I.A., and the Vicomtesse de Baillou, 126, Lexham Gardens, W., and ETHEL CARINE, elder daughter of Mr. and Mrs. GEORGE C. WAUD, Ferniehurst, Baildon, Yorkshire.

The engagement is announced between Major LESLIE F. RICHARD, R.A. and R.A.F. (retired), son of the late Walter M. Richard and Mrs. Walter Richard, 29, Chester Street, Edinburgh, and AUDREY, younger daughter of Mr. and Mrs. DOUGLAS H. BARRY, 1, Collingham Gardens, S.W.

The marriage is arranged, and will take place on June 4, at St. Mark's Church, Surbiton, between L. M. SHADWELL (late R.A.F.), second son of Julius Henry Exham Shadwell, of Surbiton, late of Horfield, Gloucestershire, and ELIZABETH V. HOLMES, only child of BATEMAN BROWN TARRING, O.B.E., and Mrs. TARRING, of 28, Claremont Road, Surbiton, only grandchild of Mr. and Mrs. F. W. Tarring, of Crouch End, and only great-grandchild of the late Bateman Brown, J.P., of Hemingford House and Bridge House, Huntingdon.

IN PARLIAMENT

Air Ministry Headquarters Staff

MAJOR J. EDWARDS, on April 13, asked the Secretary of State for Air the number of ex-Service men, non-ex-Service men, and women employed in the Air Ministry on January 1, 1921, and April 1, 1921, respectively?

Capt. Guest: On January 1, 1921, the headquarters staff employed at the Air Ministry consisted of 1,303 ex-Service men, 550 non-ex-Service men, and 538 women. On April 1, 1921, the numbers were—1,285 ex-Service men, 448 non-ex-Service men, and 423 women. This information is embodied in Returns presented to Parliament each month as Command Papers.

Royal Air Force.

Mr. RAPER, on April 21, asked the Secretary of State for Air in what way the character and requirements of service in the Royal Air Force differ from those in the Army to such an extent as to justify the Army officer being treated more favourably than the Royal Air Force officer in the matter of pay and allowances?

Capt. Guest: The terms of pay and service in the Royal Air Force were settled by a joint pay committee of the three Services. The subject was very fully discussed over a long period of time, and my hon. friend should not forget that the organisation, training and conditions in the Royal Air Force are so different from those in the Navy or the Army, and that any exact comparison is exceedingly difficult. The questions of age and responsibility also enter into this question. Finally, it is not admitted that Army officers are treated more favourably than Royal Air Force officers in the matter of pay and allowances.

Secretary of State for Air

LIEUT.-COMMANDER KENWORTHY, on April 25, asked the Prime Minister if he is aware that in the Air Force (Constitution) Act of 1917 it is laid down that the President of the Air Council shall be one of His Majesty's principal Secretaries of State; and if he will explain why the Minister for Air is not a member of the Cabinet?

The Prime Minister: The Act of 1917 does not prescribe that the Air Minister should be a member of the Cabinet.

Lieut.-Commander Kenworthy: May I ask the right hon. gentleman if he does not think it very desirable that he should be a member of the Cabinet, in view of the fact that this service has had to struggle for its very existence with the Army and Navy?

An Aerial Torpedo

FROM Paris it is reported that a French engineer, Damblanc, has designed an aerial torpedo which can be launched from an aeroplane and then controlled on its path by wireless. The new torpedo is said to be provided with small planes, which enable it to glide towards its objective, and it is thought that this will be a great advantage over a bomb, which has to be dropped approximately above the target.

Aeroplane to the Rescue

ACCORDING to the *Pioneer*, an aeroplane played an important part in dispersing a party of Mahsuds who attacked a party of Punjabis that were escorting a convoy. The Punjabis were surprised by an ambush of Mahsuds and sustained heavy losses, until an aeroplane arrived on the scene and attacked the enemy with such good effect that the surviving Punjabis were able to extricate themselves, and the convoy made its way back to Haidari Kach.

AIRISMS FROM THE FOUR WINDS

MLLE. BOLAND, who recently flew the Andes, has been honoured with a gold medal by the Argentine League of Patriots at Buenos Aires.

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AFRICA—especially the northern section, looks like being thoroughly "airyfied" by our French neighbours. Plans upon a most elaborate scale for cross-hatching Morocco with air-routes are already in existence, and the necessary connecting link between France and Africa is now being seriously considered by M. Laurent Eynac, French Under-Secretary of State for Aeronautics, and M. Gaston Vidal, Under-Secretary of State for Physical Culture. Where the latter comes in upon the job is not exactly apparent.

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IF Cape Town air enthusiasts can instil their views into those who control the affairs of South Africa, aviation should quickly flourish with much profit to its progress and to the great Colonial organisation which is swayed from Cape Town. There is evidence in this direction to be gathered from the first annual report of the Aero Club of South Africa, just to hand, detailing the work of that body up to February 21st last. It is an active executive which guides the club. Although a small body at the moment, with a little encouragement there is the promise of unlimited scope for splendid missionary work to be done in South Africa at the hands of the club. Already the membership totals 171, and from information gleaned from the Club's Year Book, everything has been organised upon a thoroughly businesslike and sound footing. Prince Arthur of Connaught is President, and in Major H. R. Coningsby as Chairman, and Capt. L. Van der Byl as Hon. Secretary and Treasurer, are to be found a valuable asset towards future success, backed as they are by a practical committee, each member of which has aviatic progress at heart.

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DURING the past year the club has kept itself to the fore in affairs by seizing opportunities as they came along, to see that aviation events were properly appreciated by the general public. In this wise, when only a couple of weeks old they were able to arrange receptions and appreciations for Col. Van Ryneveld and Capt. Brand in connection with their London-Cape flight. In like manner they included in the honours, Captains Broome and Cockerill, who were at the time in Cape Town, for their glorious failure, all four being elected Hon. Life Members of the club. Later, Sir Whitten and Lady Brown were entertained upon their arrival in South Africa, whilst valuable conference work also stands to the credit of the club's Executive.

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THAT this organised body is helping things along is plain from the fact that the club was approached by the Secretary for the Minister of Defence, requesting a list of the names of members who were desirous of being placed on the Air Force Reserve. This resulted in a list containing the names of 30 members of the club being sent in, and the chairman looks forward to the Director of Air Services taking advantage of the services offered by these ex-flying officers, which would be of untold value to the country.

And with all this the subscription is a modest guinea per annum. May the A.C. of S.A. long prosper.

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LONDON long since decided against perpetuating the hundred and one spots where the Huns dropped their "eggs" during their air-raids. Paris seems to take an opposite view of the same problem.

The spots where the first and last bombs fell in Paris have for some time been marked by plaques on adjacent walls, and it is now becoming more and more a general custom to mark with some simple inscription the various other points of the capital where damage was done by German bombs and shells. Thus in the Rue de Choiseul, near the Opera, a tablet has been placed on the wall of the Credit Lyonnais, bearing the simple inscription: "Aeroplane bomb. January 30, 1918." It was at 11 o'clock in the evening that an aeroplane attack was signalled, and shortly afterwards an aerial torpedo fell in the Rue de Choiseul, killing a French soldier on leave and two Australians who were coming from the boulevards. The torpedo wrought great havoc among the numerous bank buildings in the vicinity.

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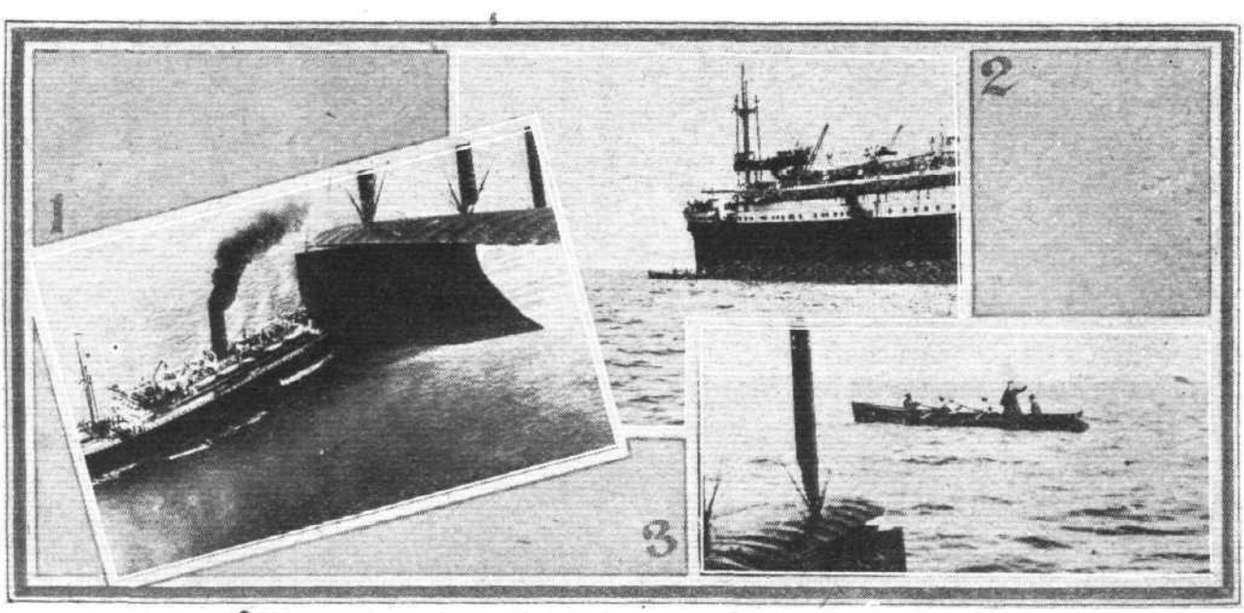
HOW Mr. G. H. Wells views future problems of the air, as related to progress, is one of the side issues which emerge in a series of articles in the *Sunday Times*, entitled "The Salvaging of Civilisation." Mr. Wells apparently pins his faith, if the problem is to be satisfactorily settled at all, to a vast development of transport as the solution, and in this air-transport is to take no mean part. In referring to this theme, Mr. Wells writes:—



A SUPERMARINE TO THE RESCUE: When Miss Pearl White, the famous Cinema actress, was in Bermuda, she missed the steamer that was to carry her home to New York by five hours. However, the Bermuda and West Atlantic Aviation Co., Ltd., placed a Supermarine Channel-type flying-boat at her service, and the steamer was overtaken, and Miss White taken on board. Our photographs—altogether a real smart piece of work—show (1) the steamer seen from the Supermarine, (2) the boat putting off from the steamer, (3) Miss White waving good-bye to the pilot of the Supermarine.

"I was a member of the British Civil Air Transport Committee, and we went with care and thoroughness into the possibilities and probabilities of the air. My work on that Committee convinced me that in the near future the air may be the chief, if not the only, highway for long-distance mails, for long-distance passenger traffic, and for the carriage of most valuable and compact commodities. The ocean ways are likely to be only the ways for slow travel and for staple and bulky trade.

"And my studies on that committee did much to confirm my opinion that in quite a brief time the chief line of military attack will be neither by sea nor land, but through the air. Moreover, it was borne in upon me that the chief air routes of the world will lie over the great plains of the world, that they will cross great stretches of sea or mountainous country only very reluctantly." In many respects, however, some of the views expressed by Mr. Wells are badly off the line.

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SIR OLIVER LODGE, like most other scientists, is very intrigued with the possibilities of the next war, and the terrors it is likely to bring in its wake. Poison gas and other chemical abominations are the chief troubles seen looming large in all their hideousness, aircraft, besides its other aggressive functions, being bracketed with these anti-human concoctions, as distributors thereof. Sir Oliver positively makes one shiver when he goes a step further, and visualises the possible harnessing by man of "Atoms." The energy now discovered, Sir Oliver states, as existing inside atoms of matter is enormous—far greater than any chemical energy such as hitherto has been our sole resource. The energy of a molecule, even in a high explosive, is insignificant compared with the energy in the atoms of any perfectly innocuous and inert substance. Radio-active substances are known to give off this energy spontaneously, at a slow and measurable rate.

So long as the liberation of atomic energy is spontaneous, and therefore slow, precautions against damage are now understood and can be taken. In many cases the projectiles have even been harnessed so as to be available for human use.

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BUT the danger will begin when the discovery is made of how to break up the atom artificially.

Just at present no one knows how to do this. We have learnt to control them when spontaneously produced, but we have not yet learnt how to produce them.

But already there are indications that atoms can be broken up on a very small scale inside a vacuum tube, and when that happens particles are shot off with a velocity that would carry them a thousand miles in the fraction of a second if there were no obstruction.

This is indeed the beginning of the liberation of atomic energy. The trigger, as it were, is pulled and the explosion follows.

In any visible speck of matter there are millions and millions of atoms, and if their combined energy were liberated the effect could not be contemplated without dismay.

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FORTUNATELY the discovery has not yet been made, but in Sir Oliver's judgment "there seems nothing impossible in it, and in some form or other it seems likely that it may be made within, say, the next twenty years."

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SIR OLIVER, having painted the black side of the picture, sees no way out of it but by an international agreement to forbid the use in war or for any other vicious purpose, of these diabolical, wholesale annihilators of the human race. He then gets to the crux of the whole thing, atoms or no atoms, after pointing out that the art of flying must progress, and hence it must always be physically possible to drop bombs and other deleterious products broadcast.

The danger arises, he says, when a Hague Conference determines that certain things should not be used, for such a restriction, if not universally applied, would be all in favour of a criminal nation which secretly disobeyed the Convention.

And from past experience it can hardly be doubted that the Huns would not hesitate to pledge themselves to anything, and unhesitatingly indulge in frightfulness of the most ghastly character, so long as they thought they would accomplish their ends.

So let us go on building war 'planes just the same against the time when distribution of the goods may become a necessity for self-preservation.

R.A.F. "Special Mention"

UNDER date September 20, 1920, a despatch has been received by the Secretary for Air from Lieut.-General Sir J. A. L. Haldane, Commanding-in-Chief Mesopotamian Expeditionary Force, submitting the following list of names of officers, warrant officers, non-commissioned officers, and men whose services are recommended as deserving of special mention :—

Royal Air Force.—Bladon, Flying Officer G. C., No. 30 Sqdn., R.A.F.; Mayoss, Flying Officer (Actg. Flt. Lieut.) W. F., No. 6 Sqdn., R.A.F.; Thomas, Flt. Lieut. M., A.F.C., No. 30 Sqdn., R.A.F.; Cook, No. 155542 L.A.C. C. W., No. 30 Sqdn., R.A.F.; Cooling, No. 333099 L.A.C. G. F., Aircraft Park, R.A.F.; Croft, No. 313065 Flt. Sergt. G. C., Aircraft Park, R.A.F.; Jennings, No. 156440 A.C.2 B. J., No. 30 Sqdn., R.A.F.; Monk, No. 155943 A.C.2 D., No. 30 Sqdn., R.A.F.; Pengelly, No. 89309 A.C.1 W. A. L., No. 30 Sqdn., R.A.F.; Robinson, No. 83034 A.C.2 J., No. 30 Sqdn., R.A.F.; Tuckey, No. 2389 Flt. Sergt. J. H., No. 6 Sqdn., R.A.F.; Wilson, No. 201 Flt. Sergt. B. W., No. 6 Sqdn., R.A.F.

Three New French Chevaliers

MESSIEURS HENRI POTEZ, F. LIOREE and P. FUGAIRON have just been made Chevaliers of the Legion of Honour. Potez is well known as an aeroplane maker, as is also Lioree of the house of Lioree and Olivier. M. Fugairon we do not know personally, but he is said to be a distinguished pilot, among his accomplishments being a flight from Bordeaux to Tetouan.

The Brennan Helicopter

ALTHOUGH given far less publicity than those of the French and other experimenters, the experiments of our own "helicopterists" have been progressing during more than a year, and certain remarkable results have been attained. Thus it will come as a surprise to many that the helicopter has actually been shown to be capable of very high horizontal speeds, a feature with which this type of machine is not usually credited. The reason is, however, not far to seek. There is little surface to offer resistance to horizontal motion, the airscrew blades that are travelling from front to rear during the rotation of the screws tending to counteract the resistance of those moving forward, although naturally unable, owing to the forward movement of the whole machine, of quite doing so. Among our most advanced experimenters is Mr. Louis Brennan of monorail fame, whose machine has for a considerable period been at Farnborough, where the experimental work has been carried out. It is to be presumed that, being actually installed at "the factory," Mr. Brennan has had valuable assistance from the wind tunnels and whirling arm, and one therefore supposes that those set in authority incline to the opinion that "there is something in it." Whatever the fate of the Brennan helicopter when it is tested in flight shortly, the knowledge gained from the experiments should serve to indicate whether it is worth while to proceed along these lines or not.

R.A.F. Sports at Cranwell

AT the Sports of the R.A.F. (Cadet) College, held at Cranwell this week,, "B" Squadron won the Athletic Challenge Cup with 24 points to 20 points by "A" Squadron, and the Victor Ludorum was M. C. Hayter, who scored 12 points, J. G. Hawtry obtaining 9 points. The results were :—

Long Jump.—E. B. Forster, 1; C. W. Gore, 2; F. E. Nuttall, 3. Distance, 18 ft. 9¾ ins.

One Mile Race (Final Heat).—J. G. Hawtry, 1; S. G. Conolly, 2; R. Lewes, 3. Time, 4 mins. 49 3-5 secs.

Putting the Weight.—N. Vintcent, 1; R. S. Spaight, 2; J. S. Newall, 3. Distance, 27 ft. 5 ins.

Throwing the Cricket Ball.—M. C. Hayter, 1; A. K. Lewis, 2; C. W. Gore, 3. Distance, 85 yds. 10 ins.

220 *Yards Race (Final Heat).*—M. C. Hayter, 1; C. H. A. Stevens, 2; N. Carter, 3. Time, 24 1-5 secs.

Half-Mile Race (Final Heat).—J. G. Hawtry, 1; S. G. Conolly, 2; R. Lewes, 3. Time, 2 mins. 17 1-5 secs.

High Jump.—F. E. Nuttall, 1; E. B. Forster, 2. Height, 5 ft. 5 ins.

100 *Yards Race (Final Heat).*—M. C. Hayter, 1; C. H. A. Stevens, 2; R. S. Spaight, 3. Time, 10 3-5 secs.

Two Miles Race (Final Heat).—J. G. Hawtry, 1; N. C. Hayter-Hames, 2; R. Lewes, 3. Time, 11 mins. 2 4-5 secs.

120 *Yards Hurdles (Final Heat).*—C. W. Gore, 1; F. E. Nuttall, 2. Time, 19 secs.

440 *Yards Race (Final Heat).*—M. C. Hayter, 1; C. H. A. Stevens, 2; R. Lindsay, 3. Time, 56 1-5 secs.

Tug-of-War.—"A" Squadron beat "B" Squadron.

Inter-Squadron One Mile Relay Race (440 yards, 880 yards, and two 220 yards).—"A" Squadron, 1. Time, 4 mins. 6 1-5 secs.

Obstacle Race.—G. C. Gernard-Smith, 1; O. L. G. Bett, 2; E. B. Coventry, 3.

THE ROYAL AIR FORCE

London Gazette, April 8

Flying Branch

Flt. Lieut. B. St. J. Boultbee, M.C. (Lieut., Northants R.), relinquishes his temp. commn. on return to Army duty; March 10. Maj. G. H. Cox, A.F.C., relinquishes his temp. commn. on acct. of ill-health contracted on active service, and is permitted to retain his rank; March 24. Sec. Lieut. S. G. Dyson (late Gen. List, R.F.C., on prob.) is confirmed in rank as Sec. Lieut. (O); May 30, 1918 (since killed). *Gazette* of June 7, 1918, relating to A. I. Williams (Lieut., Mon. R., T.F.) is cancelled.

Technical Branch

Lieut. R. S. Broderick is placed on Retired List; Feb. 20.

Medical Branch

A. F. Wright, M.B., is granted a temp. commn. as Flt. Lieut., with effect from, and with seny. of, March 22.

The follg. relinquish their temp. commns. on return to Naval duty (April 1):—Wing Comdr. G. D. Bateman, O.B.E. (Surg.-Comdr., R.N.), Sqdn. Ldr. A. R. Sharrod, M.B., B.S. (Surg. Lieut.-Comdr., R.N.).

London Gazette, April 12

Permanent Commissions

Sqdn.-Ldr. J. C. P. Wood is placed on half-pay, Scale B; Mar. 31.

Stores Branch

Flying Offr. J. Lundon is granted a permanent commn., retaining his present substantive rank and seniority; June 17, 1920.

Short Service Commissions

The follg. are granted short service commns. in ranks stated, with effect from dates indicated, retaining their seniority in the substantive rank last held prior to grant of this commn., except where otherwise stated:—

Flying Officers.—T. K. Breakell; Mar. 24. E. A. W. Kent; Mar. 29. E. M. Milling; Mar. 24.

Flying Officers. from Pilot Officers.—With seniority of dates indicated.—E. F. Mattock; Mar. 31. V. D. Smith; Mar. 24.

Flying Officers.—R. de H. Hutchinson; Mar. 20 (with seniority of that date).

Pilot Officer on Probation.—H. E. Greenberry; Mar. 29 (and with seniority of that date).

Medical Branch

The follg. are granted short service commns. as Flight Lieuts., with effect from and with seniority of April 4.—M. J. Cahalane, M.B., Ch.B., O. St. L. Campion, M.R.C.S., L.R.C.P.; S. E. Elphick, M.R.C.S., L.R.C.P.

Stores Branch

Flying Offr. H. Forrest is granted a short service commn. for three years on the active list, retaining his present substantive rank and seniority; June 17, 1920.

Seconding and Reseconding

The follg. Lieuts. (Army) are granted temp. commns. as Flying Offrs. on seconding for four years' duty with the R.A.F.—A. R. Farrow (R.F.A.), Q. A. Kennedy (R.G.A.), A. H. H. MacDonald (Norf. R.); March 23.

The follg. Lieuts. (Army) are granted temp. commns. as Flying Offrs. retaining their previous seniority in that rank on reseconding for four years' duty with the R.A.F.—W. E. Knowlden (Bord. R.), M. V. Molony (R.W. Kent R.), T. H. R. Riggs, D.C.M., M.M. (Linc. R.), W. A. B. Savile (R.F.A.); March 23. L. M. Elworthy (Essex R.); March 31.

Wing Comdr. P. S. Rickcord (Lieut. Comdr., R.N.) is reseconded to the R.A.F. for a further period of two years; March 1, 1920.

Flying Branch

Lieut. (actg. Capt.) H. C. Burdett to be actg. Maj. from May 29, 1918, to Aug. 21, 1918, inclusive, and from Jan. 15, 1919, to April 30, 1919, inclusive. Sec. Lieut. C. McH. H. Sutherland (Unemployed List) relinquishes his temp. commn. on appt. to T.F. Res., and is permitted to retain his rank. The follg. Sec. Lieuts. are transfd. to the Unemployed List.—R. T. Smith; Feb. 18, 1919. H. G. Lock; Oct. 11, 1919. *Gazette*, Sept. 13, 1918, relating to Proby. Obsvr. Offr. S. King, is cancelled.

Technical Branch

Lieut. I. F. A. Klapper relinquishes his temp. commn. on acct. of ill-health contracted on active service, and is permitted to retain his rank; March 27.

Medical Branch

The follg. are granted temp. commns. as Flight Lieuts. with effect from and with seniority of April 4.—A. E. Jenkins, M.R.C.S., L.R.C.P., W. B. Wilson, M.R.C.S., L.R.C.P.

Memoranda

One Cadet and one Overseas Cadet are granted hon. commns. as Sec. Lieuts. with effect from date of demobilisation.

London Gazette, April 15

Flying Branch

Sec. Lieut. (Hon. Capt.) W. O. Ryan, M.C., relinquishes his temp. commn. on appt. to T.F.

Technical Branch

Sec. Lieut. (Hon. Lieut.) H. Soper relinquishes his temp. commn.; March 10, 1919.

Administrative Branch

Sec. Lieut. J. C. Garratt relinquishes his temp. commn. on appt. to T.F.

Memoranda

Sec. Lieut. J. L. Taylor relinquishes his hon. commn. on appt. to T.F.

London Gazette, April 19

Permanent Commissions.

Flight Lieut. P. Huskinson, M.C., is placed on h.p., Scale B, from March 15 to March 31, both dates inclusive. The following are restored to active list from half-pay:—Sqdn. Leader R. B. Ward, A.F.C.; April 9. Sqdn. Leader J. C. P. Wood; April 9. Wing Comdr. C. E. Risk, D.S.O.; April 11.

Flying Branch.

Sec. Lieut. (Hon. Lieut.) A. G. Horlock to be Lieut.; April 2, 1918. The following officers (unemployed list) relinquish their temp. commns. on appt. to T.F., and are permitted to retain their ranks:—Lieut. H. J. H. Dicksee, Lieut. C. R. Dougall, Sec. Lieut. F. E. B. Jones, Sec. Lieut. W. O. Marshall.

The following officers (unemployed list) relinquish their temp. commns. on appt. to T.F.:—Lieut. C. N. L. Lomax, Lieut. E. G. Nuding, Lieut. (Hon. Capt.) P. A. E. Naylor, Sec. Lieut. J. Sewell.

Transferred to Unemployed List.—Lieut. G. H. Rogers; July 7, 1919. Lieut. C. P. Primrose; Feb. 27, 1920.

Administrative Branch

Sec. Lieut. (Hon. Lieut.) J. Martin to be Lieut.; June 8, 1918. Lieut. A. G. Horlock is re-classified to Lieut. Ad. from Flying; April 17, 1919. Lieut. F. L. Simmons relinquishes his temp. commn. on appt. to T.F. Sec. Lieut. A. P. Webley is transf. to unempld. list; Nov. 5, 1919.

Technical Branch

Sec. Lieut. R. D. Chisholm to be Lieut., without pay and allces.; June 10, 1919. Lieut. J. Martin is re-classified to Lieut. (T.) Cat. A. from Ad.; July 24, 1918.

Transferred to Unemployed List.—Lieut. R. D. Chisholm; Oct. 23, 1919 (substituted for *Gazette*, July 2, 1920). Sec. Lieut. J. H. Payne; April 12, 1919 (substituted for *Gazettes* Feb. 15 and March 29). Lieut. J. Martin; June 2, 1919 (substituted for *Gazette* Oct. 28, 1919).

Medical Branch

Capt. G. W. J. Bousfield is transfd. to unemployed list; April 3.

Memoranda

Three Cadets are granted hon. commns. as Sec. Lieuts. with effect from date of their demobilisation.

London Gazette, April 22

Permanent Commissions

Flying Officer R. J. Rodwell is placed on half-pay, Scale B; March 5 to March 31 inclusive.

Flying Branch

The following relinquish their temp. commns. on appointment to T.F., and are permitted to retain their ranks:—Lieut. T. F. Burrill, Sec. Lieut. A. W. Mumford, Sec. Lieut. D. Smith. Lieut. F. Lupton, M.C., relinquishes his temp. commn. on appointment to T.F. Res., and is permitted to retain his rank. Lieut. C. E. Lovick is transferred to the unemployed list; Sept. 27, 1919 (substituted for *Gazettes* Nov. 28, 1919, and March 25). Sec. Lieut. J. Stephens is transferred to the unemployed list; Oct. 11, 1919.

Administrative Branch

The surname of Lieut. (Hon. Capt.) H. D. Scowcroft is as now described and not as *Gazette* March 25.

Technical Branch

Lieut. D. Longbottom (unemployed list) is deprived of his temp. commn. on conviction by the Civil Power; April 9.

Gazette March 28, 1919, relating to Sec. Lieut. (Hon. Lieut.) J. Johnstone is cancelled.

Memoranda

Lieut.-Col. U. J. D. Bourke, C.M.G., is graded for pay and allowances, as Col. (S.O.) whilst commanding a Group; May 1, 1919.

Three Cadets are granted hon. commns. as Sec. Lieuts., with effect from the date of their demobilisation.

Hon. Sec. Lieut. L. S. Pick relinquishes his hon. commn.; March 7.

Mr. Butler has a Rival

MR. A. S. BUTLER, the owner-pilot of a Bristol machine, is not to be for long the only private owner and user of an aeroplane. Senor Bayo, a wealthy Spaniard, has purchased a Bristol "Coupe" on which he left London on April 23 for Paris *en route* to Spain. Senor Bayo intends to learn to pilot the machine himself, and his pilot, Mr. Forson, who is flying him out to Madrid, is going to teach him to fly out there. Senor Bayo prefers the aeroplane for getting about in Spain, where the roads are not always of the best, and hopes to make extensive use of his machine.

A Roumanian Air-Route

THE Roumanian Ministry of Communications has recently been authorised to open up and exploit the aerial navigation line Bucarest-Galatz-Kisinoff, and under the same decision the Ministry of Communications is purchasing the necessary material up to the value of three and a half million lei (285 lei = £1 at present rate of exchange).

Aliens by Air and the Health Act

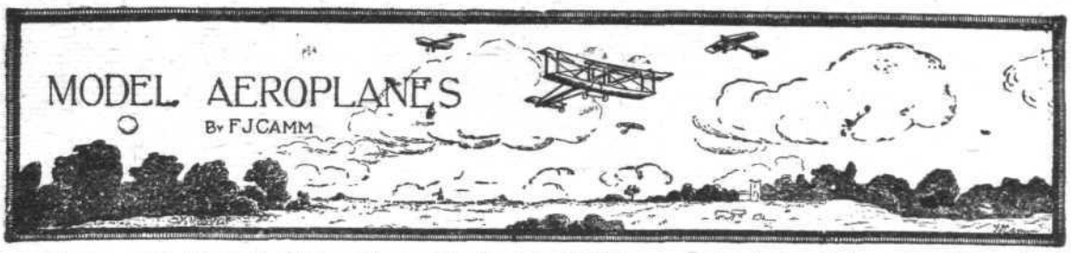
APPARENTLY aliens are taking the air-route as an easy entrance into England, and the Minister of Health is finding it necessary to institute precautions against infectious diseases being introduced into the country by this means. Action is being taken through the Beddington and Wallington Urban Council, who, at the request of the Ministry of Health, have appointed Col. Heald to be assistant medical officer of health for the purpose of inspecting all persons arriving at the Croydon terminal aerodrome.

According to Dr. Fegen (Medical Officer of Health), there are about 100 aliens arriving at the terminus every week, and he anticipates that this will be increased sevenfold within the next month or so. Hence the appointment of Col. Heald, it being arranged that the extra expense shall not fall upon the local council's funds.

Berlin-Lepzig-Munich-Augsburg Air Service

THE Berlin-Leipzig-Munich-Augsburg air service, which was inaugurated for the Leipzig Fair, is to be continued as a regular daily air service by the Rumpler-Luftverkehr, Berlin, and the Bavarian Rumpler Works, Augsburg. The departures and arrivals are as follows:—

Dep.: Berlin, 8; arr.: Leipzig, 9.15; Nuremberg-Furth, 12.15; Munich, 1.0; Augsburg, 2.40. Dep.: Augsburg, 7.45; arr.: Munich, 8.10; Nuremberg-Furth, 10; Leipzig, 12.30; Berlin, 2.15.

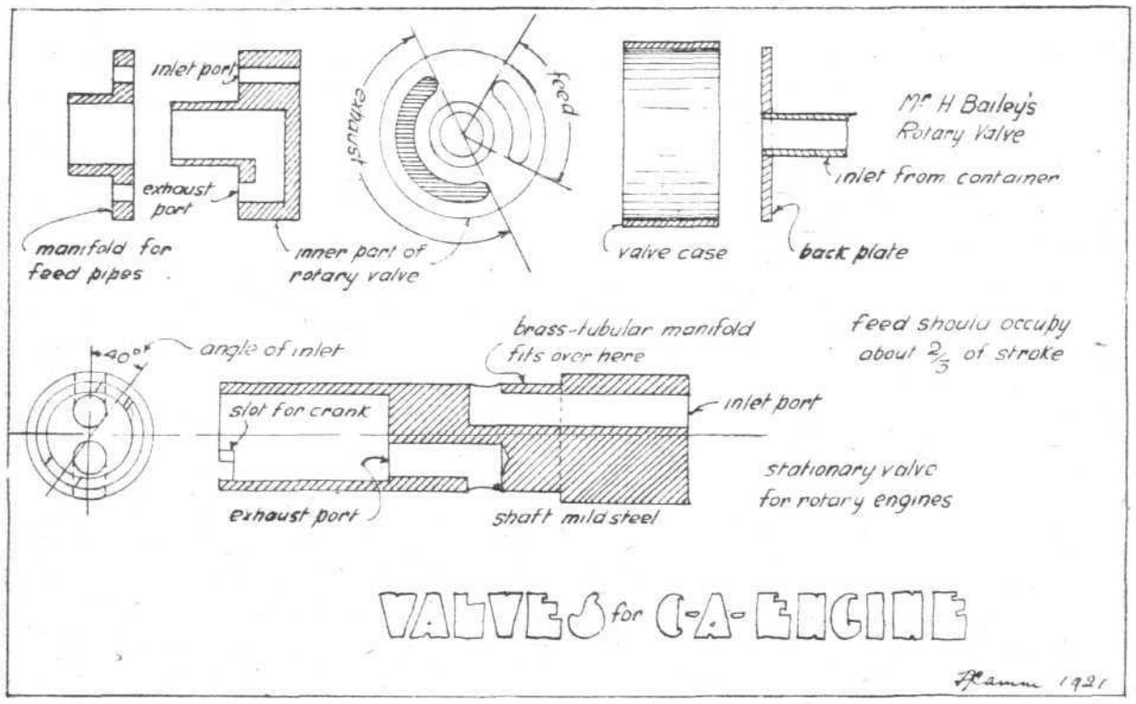


NOTE.—*All communications should be addressed to the Model Editor. A stamp should be enclosed for a postal reply.*

Valves for Compressed-Air Engines

THE most difficult portion in the construction of a compressed-air motor is undoubtedly the valve. In stationary engines this must be of the rotary type, and in rotary engines of the stationary type. A readjustment of the rotary valve makes possible its use as a stationary one.

A correspondent has sent me a clipping from "Junior Mechanics," describing an ingenious rotary valve designed by Mr. H. Bailey, which is here drawn. As I have tried this valve, I can thoroughly recommend it as being extremely efficient, provided the *timing of the inlet and exhaust is correct.* This is a most important matter. The position of the piston at the moment the inlet port is opened fixes the direction of rotation; inlet must, of course, take place *just after* the piston has reached top dead centre—about $\frac{1}{32}$ in. on the down stroke being a good position—and should continue for about two-thirds of the downstroke. During the rest of the stroke the compressed air expands, and is more conducive to a thorough scavenging of the cylinder. This expansion also allows the air to be exhausted at a lower pressure, and eliminates the cushioning effect present when air is left in the cylinder and therefore compressed by the upstroke.



The valve I found most efficient for rotary engines is also shown in the drawing. As seen, it consists of a circular shaft with a slot in one end to carry the crank. A groove is filed round the shaft from the inlet port for two-thirds of stroke, and the crank slot is cut at an angle of 40 degs. with the centre line of the inlet port according to the desired direction of rotation. The shaft is similarly filed away to form the exhaust stroke.

Fitting over the shaft is a sleeve carrying the feed pipes to the cylinders. These must be truly disposed, so that inlet commences at the correct position of the stroke. If this valve is properly made and ground in with rottenstone, it will not give the trouble, usually apparent, of leaking across the ports.

A writer in a contemporary has recently denounced the rotary as a failure; the opinion has been handed down chiefly from inexperienced experimenters who wrongly make such motors, and is nowadays accepted without cavil. My own experience (and I have experimented with almost every type) is that the rotary, properly made, is quite as efficient as the stationary.

Unfortunately several rotaries are at present on the market which would tend to the opinion aforementioned. They are made of the flimsiest material, the propeller-shaft is about $\frac{1}{8}$ in. out of truth, the valve does not fit and is wrongly timed, the cylinders are out of alignment and wrongly disposed, and they are only of about 15 per cent. efficiency. I certainly would not care to recommend any of the commercial compressed-air rotaries that I have had an opportunity of testing.

The Model Aeroplane Industry

DESPITE hopes to the contrary, the *status quo* in model-aeroplane enthusiasm has failed to materialise, and it is, perhaps, well to look for the cause, being cognisant of the effect.

To be quite frank, I think that the dozens of mushroom firms who have been selling rubbish at fabulous prices have killed enthusiasm. Unfortunately, the number of people who can make a model aeroplane are few, compared with the number interested in it. Unscrupulous persons (one is pleased to note that they do not advertise in FLIGHT) have taken advantage of this enthusiasm to the detriment of the established firms. A purchaser who pays 50s. for a tractor biplane surely has a right to expect it to fly, and not imitate a grasshopper? The truth is that few of them lasted for more than a couple of flights, and the purchaser, becoming disgusted, gave up the hobby.

Another reason, perhaps, is the extreme vulnerability of models in any but the expert's hands. I am strongly of the opinion that insufficient has been done to foster the enthusiasm of the newcomer, who is dependent on the model-accessory people for his every want. A man has a right to expect satisfaction for the high prices asked of him. I think, too, that construction from the commercial end hasn't developed very far. It is time something was done to make models more durable in the hands of a novice. I think, too, the K.M.A.A. might have "shown a leg" ere this.

Illinois Model Aero Club

I HAVE received a letter from Mr. D. W. Pease, Secretary of the above club, *re* an international competition. This club has already entered into correspondence with a German club with this end in view. I certainly think that such a competition would lead to a better understanding between the clubs of various countries, and also to a more general acceptance of world's records. Undoubtedly at the present time animosity exists between the modellists of England and America which such a competition would remove. Here is a matter for the K.M.A.A. One is bound to admit that American clubs are the more enthusiastic and consistent in their enthusiasm.

SIDE-WINDS

Being able to control at will the light of headlamps is a blessing to both user and the other fellow. We are therefore glad to be able to help clear up a matter upon which there is some misapprehension. The headlamp-dipping mechanism, which offers so efficient and inexpensive a solution of the headlamp-glare problem, invented by Mr. F. Lionel Rapson, and applied to his and his friends' cars, has not been patented by him, and will not be, and Rapson Automobile Patents, Ltd., as the company exploiting his other inventions, are not making commercial application of this idea.

* * *

As we learn Mr. Rapson himself is simply inundated with enquiries concerning this matter, he desires us to state that he will be very happy to send a set of drawings explaining his mechanism to any of our readers who will make application fo them at the Company's offices, 35, New Cavendish Street, Great Portland Street, W. 1, without any charge, his desire being that the greatest possible number of motor-car users shall be able to avail themselves of the great convenience—both to themselves and other road-users—of this idea.

* * * *

Poulet on the Wing Again

After a stay of several months Poulet and his mechanic Benoit and a passenger have left Java on their Caudron biplane and have arrived at Celebes, where they have landed at Kakaskassen, on an aerodrome situated about 2,500 ft. above sea level. The aerial travellers were fêted by the European populace.

Kirch Gets Upstairs

On his Nieuport single-seater, 300 Hispano, the French pilot Kirch recently put up a very fine performance by climbing to an altitude of 19,700 ft. in 14 mins. The stages of the flight were accomplished in the following times: 3,300 ft. in 2 mins., 6,600 ft. in 3 mins. 35 secs., 9,850 ft. in 6 mins, 13,100 ft. in 8 mins. 35 secs., 16,400 ft. in 11 mins. 15 secs., and 19,700 ft. in 14 mins.

The Concours Militaire

Lieut. Gonin continues to plod along on his three-engined Farman Goliath, covering his 500 kilometres a day. On April 21 he was troubled with rain, but managed to complete his flight. He is expected to complete his last stage any time now.

Bellanger Works Build Monoplane

It is reported that the automobile firm of Bellanger have just completed the designs for a new large amphibian machine. Designed by M. Richard, the monoplane will have a span of 21 metres, and will be driven by three engines of a total power of 1,500 h.p. It is to carry 30 passengers, and will be able to alight on either land or sea.

Echo of a War-Time Air Raid

In connection with the unfortunate incident of the War in which a British aeroplane mistook its direction and dropped bombs on a Dutch village, the occupants being under the impression they were over German territory, Jonkheer Dr. H. A. van Karnebeek, Dutch Minister for Foreign Affairs, has informed the Chief Magistrate of the Province of Zeeland that he has received from the British Government 16,381 guilders 76 cents (about £1,500), the amount due for reparation damage caused by the raid which took place on December 22, 1917.

Dutch Air-Post Charges

The extra charges for the International air-mail service, the Dutch Postmaster-General announces, will be for Belgium 10 cents (2*d.*); Great Britain, Ireland, France, and Germany, 15 cents (3*d.*); Denmark, 25 cents (3*d.*), all per 20 grammes (about ¾ oz.).

By Air: One Day instead of Three to Seven Days

Dakar, in Senegal, is to be linked up with Kayes through a French company formed by M. Georges Madon, President of the League of Pilot-Aviators and a well-known war "ace." The company proposes instituting an air service along the Senegal coast between Dakar and St. Louis, and Dakar inland to Kayes. The first service will occupy eighty minutes, against seven hours by railway, and the latter cross-country service about one day compared with three days by automobile and seven days by rail. Thus France continues to blaze the trail bravely throughout her possessions.

The Gottenborg Air Station

The Gottenborg municipal authorities have decided to apply to the Swedish Government for permission to expropriate certain land in the parish of Torslanda on the island of Hisigen, for the purpose of laying out an air station.

PUBLICATIONS RECEIVED

Timbers for Woodwork. By Wm. Bullock. London: Evans Brothers, Ltd., Montague House, Russell Square, W.C. 1. Price 4*s.* 6*d.* net.

Technical Note No. 33. *The Effect of the Nature of Surfaces on Resistance as Tested on Struts.* By Dr. Ing. C. Wieselsberger, National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 43. *Note on the Resistance of Polished Cylinders (and Cylindrical Wires). With Generatrices Perpendicular to the Airstream.* By A. Toussaint. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 47.—*Recent European Developments in Helicopters.* National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 54. *The Factors that Determine the Minimum Speed of an Airplane.* By F. H. Norton. National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

Technical Note No. 55. *Airplane Crashes: Engine Troubles. A Possible Explanation.* By S. W. Sparrow. National Advisory Committee for Aeronautics, Navy Building Washington, D.C., U.S.A.

Report No. 105. *Angles of Attack and Air Speeds During Manœuvres.* National Advisory Committee for Aeronautics, Navy Building, Washington, D.C., U.S.A.

* * * *

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: **cyl. = cylinder; I.C. = internal combustion; m. = motors**

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1919

Published April 28, 1921

20,552. G. C. Draper. Inclinometers. (160,858.)
26,373. J. H. Worthington and A. L. Chevallier. Gyroscopic appliances. (160,868.)
26,836. H. Roussilhe. Aerial photography. (160,869.)
32,078. L. Maublanc and N. Laillie. Screw propellers. (160,901.)
32,242. A. Reitsma. Rotary engines. (160,904.)
32,673. J Bowen. Cooling of air-cooled engines. (160,926.)

APPLIED FOR IN 1920.

Published April 28, 1921

1,101. F. Murphy. Wireless direction-finding systems. (160,975.)
1,249. R. M. Radio, Ltd., and H. St. J. de A. Donisthorpe. Portable radio telegraphic and telephonic apparatus. (160,981.)
8,767. D. J. Nooney and E. E. Brown. Metal spars, longerons, etc. (161,063.)
10,401. J. T. Thompson. Aircraft. (161,072.)
10,979. Akt.-Ges. R. Bosch. Starting of rotary I.C. engines. (142,107.)
15,784. P. C. Hewitt. Flying-machines. (145,011.)
20,712. H. Junkers. Radiators. (148,889.)
22,899. Soc. des Moteurs Salmson. Radial cyl. explosion m. (149,976.)
33,952. Sperry Gyroscope Co. Gyroscopes. (161,133.)

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